FACTORY

MANAGEMENT AND MAINTENANCE

JUNE 1948

SPECIAL REPORTS	Let's Be Sure of Our Machine Tools for National Security		66
	A Year of the New Labor Law		90
EDITORIAL	We Can Do More Than Talk to Ourselves		65
PRODUCTION	Straight-Line Assembly Served by Elevators		74
	Cases in Work Simplification – 8. Apex Manufacturing Company		78
	Made a New Layout to Get Assembly Savings		84
	Production Flow Charts – 5. Automobiles	following	96
	Continuous-Flow Finishing in Multi-Story Building		102
	Production Control for Mixed Long and Short Runs		110
	Using a Combination of Methods to Get Effective Layout		120
MAINTENANCE	Power: When to Make, When to Buy		81
	Saved Money by Raising Power Factor		88
	How to Minimize Trouble With Rubber Conveyor Belts		106
	Where Electrical Fires Start in Industrial Plants		116
	New System Slices 10 Per Cent From Maintenance Labor Costs		122
INDUSTRIAL RELATIONS	Something for Everybody in This Training Plan		73
	"Plus Business" Bonus Pays Off for Greater Productivity		82
	A Safety Program That Overlooks Nothing		97
	Posters and Pennies Launch $100,000 Waste Campaign		113
	Reports to Employees That Really Get Read		126
	Shop Rules and Penalties – *Management Data Sheets*		134

DEPARTMENTS — Looking Ahead in Labor, 129 • Looking Ahead in Business, 130 • Operating Shorts, 131 • What's New in Equipment, 138 • You Want to Know, 206 • Significant Labor Developments, 216 • They Say and Do, 234 • Behind the Byline, 246 • Books and Booklets, 258 • On the Calendar, 264 • Catalog Service, 272

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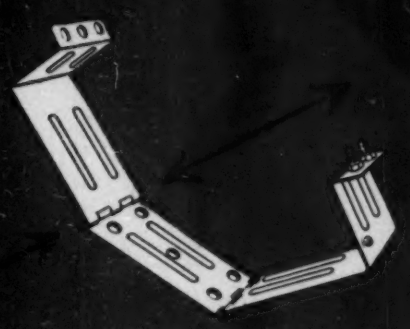

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JUNE, 1948

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SPECIAL REPORTS

Let's Be Sure of Our Machine Tools for National Security . . . 66
A Year of the New Labor Law 90

EDITORIALS

5,000,000 Youngsters Need Our Aid Now . . . . . *following* 64
We Can Do More Than Talk to Ourselves 65

PRODUCTION

Straight-Line Assembly Served by Elevators 74
Cases in Work Simplification—8. Apex Manufacturing Company . 78
Made a New Layout to Get Assembly Savings 84
Production Flow Charts—5. Automobiles . . . . . *following* 96
Continuous-Flow Finishing in Multi-Story Building 102
Production Control for Mixed Long and Short Runs 110
Using a Combination of Methods to Get Effective Layout 120

MAINTENANCE

Insulation Improves Equipment Efficiency and Operator Comfort . 76
Power: When to Make, When to Buy 81
Saved Money by Raising Power Factor 88
How to Minimize Trouble With Rubber Conveyor Belts 106
Where Electrical Fires Start in Industrial Plants 116
New System Slices 10 Per Cent From Maintenance Labor Costs . . 122

INDUSTRIAL RELATIONS

Something for Everybody in This Training Plan 73
"Plus Business" Bonus Pays Off for Greater Productivity 82
A Safety Program That Overlooks Nothing 97
Posters and Pennies Launch $100,000 Waste Campaign 113
Reports to Employees That Really Get Read 126
Shop Rules and Penalties—*Management Data Sheets* 134

DEPARTMENTS

Looking Ahead in Labor . . . 129
Looking Ahead in Business . . 130
Operating Shorts 131
What's New in Equipment . . 138
You Want to Know 206
Labor Developments . . 216
They Say and Do . . . 234
Behind the Byline . . . 246
Books and Booklets . . . 258
On the Calendar 264
Catalog Service 272

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CONFUSION AND RUMORS IMPEDE INDUSTRIAL MOBILIZATION

SLOW DISSEMINATION of industrial mobilization planning information by the military — in the face of increasing industrial interest — is exerting a disturbing influence on much of top management.

And damaging misconceptions are arising from the confusion of the *allocations* plan with the so-called *procurement* plan. Munitions Board officials claim that the two are successive steps in a single plan. But the "Guide for Joint Industry-Military Procurement Planning," made public on June 1, fails to make this relationship apparent.

AN ON-THE-SPOT SURVEY of leading industrial centers by FACTORY found manufacturers anxious to cooperate, even to take the lead. But lack of direction from Washington has them confused to the point where there is no general agreement as to what constitutes the proper course to follow.

BIGGEST ITEM TROUBLING INDUSTRY

ANNOUNCEMENT by the Munitions Board of the so-called industry-military procurement plan failed to dispel the confusion created during the many months that this plan was held a closely guarded secret. Manufacturers acquainted with the allocations plan, announced some time ago, had been worried by rumors concerning the content of the procurement plan. *The worry was a waste of time.*

The procurement plan changes nothing, adds little to manufacturers' still-too-meager store of information on "how to cooperate" with the government in the industrial mobilization drive.

1. Allocation, according to the Munitions Board definition, is "the assignment of production capacity in manufacturing facilities by the Munitions Board to a military department for its procurement agencies to accomplish *peacetime planning for wartime procurement* of designated quantities of specified items of matériel at specified rates of production." The limitations of the allocation procedure and the methods for carrying it out (including forms) are provided in the document known as "Annex 47."

2. Procurement planning, as such, is not defined in the guide. After admitting that "planning for industrial mobilization is difficult for the businessman," the document proceeds to offer a minimum of assistance. Principal features are a check-list for internal planning (broader than forms in Annex 47); and lists of strategic materials in short supply, purchasing locations, and procurement planning offices, most of which FACTORY published in April (see Communiques Nos. 2 and 3).

After a careful examination, FACTORY can only report that there is nothing in this newly public document which need disturb plans on the part of individual companies for proceeding now *on their own initiative* to make internal surveys of their war mobilization potential.

MUNITIONS BOARD CLEARS SOME MISUNDERSTANDINGS

A LIMITED NUMBER of manufacturers — individually or as groups — have undertaken to survey their own plants before military representatives arrive. The idea behind this move, of

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course, is to have data assembled and ready for the government instantly it is requested, *and to be prepared to discuss the entire matter intelligently.* Also, some of these manufacturers told FACTORY, they feel that they can do a better job independently, before any possible "pressure" is applied. Emphasized is the need for studying special problems and limitations which might not get careful consideration unless the need for it has been proved in advance.

However, there is less than agreement among industrialists as to whether this is a wise or a wasteful course to follow. For example, one manufacturer with whom FACTORY talked, feared that any move in the direction of a self-survey would be an open invitation to the Army and Navy to "send a squad of junior-grade lieutenants into the plant." He saw this as meaning disruption of normal operations and prying into private company affairs. Others, while less violent in their appraisals, held much the same view.

But Gen. Hugh C. Minton, of Koppers Company, says "there are not enough trained officers in the armed forces and not enough time to survey intelligently." Now or later, he says, industry's assistance will be required.

Here is what the Munitions Board says about self-surveys at the present time:

"The Board intends that industry make its own survey of its capabilities to produce war matériel and has provided a suggested form to be used as a guide (form MB 104, in Annex 47). This same form will be used by the survey officer when he asks questions."

FACTORY was assured by the Munitions Board that these, in brief, will be the duties and functions of the procurement planning officer who will facilitate mobilization planning with plant officials:

Minimize visits, surveys, and communications.

Make arrangements with the management for plant visits and surveys to meet the Board's or management's own planning requirements.

Maintain complete records of the production potential of the plant under his jurisdiction, including the capacity under allocation, as well as capacity available for later allocation by the Munitions Board.

This officer will not have the authority to pry into company records without company permission. His information will depend solely upon what the plant officials tell him.

THREE COMPANY VIEWS

MANY of the executives with whom FACTORY talked were bewildered and confused by the rumors concerning future Munitions Board planning. FACTORY reported the views of three of these men to the Munitions Board, and records here their statements, together with the Munitions Board replies.

President, Company A: "I haven't heard the details, but I'm getting busy. By the time they come around here, I'll have all the facts ready for them. I'll know just what we can do and what we can't do. If any preparedness orders go out, I'm going to be sure I have done everything possible to get the one I am best suited to handle."

The Munitions Board's answer:

"This is exactly what we should like industry to do. This survey must be a cooperative job. Industry must know its capabilities before we start asking questions."

General Manager, Company B: "I've tried everywhere possible and I can't find out a thing about the procurement plan. So tell me this: Why should I waste time and money doing *anything* until the plan is made public or until somebody from Washington tells me what to do? If I make any moves on my own, some bureaucrat will make me do it all over again because I put a comma in the wrong place."

The Munitions Board's answer:

"Obtain Annex 47, and your questions and ours will be answered."

President, Company C: "Some of my friends are urging me to go all out and get ready for defense orders; others tell me to sit tight, do nothing, and hope the Army will leave me alone. I don't want to appear to be an alarmist by getting ready for something that may not come. But I do want to be completely prepared to cooperate with the armed services. I honestly don't understand the need for all this secrecy. There must be thousands of people in my position. Why won't the military tell us what's going on so we'll know what to do?"

The Munitions Board's answer:

"This man is confusing current procurement, which has been greatly overrated, and procurement planning. If he will obtain Annex 47 he will understand what we want to do and what he can do to help us."

TWO MEN ENTER DISSENTS

YET ONE EXECUTIVE who claimed he had seen the latest draft of the procurement plan takes a completely contrary view. This executive told FACTORY that he believed companies currently engaged in self-surveys are being "altogether too forehanded." These companies should not, he said, take any mobilization survey action until individually approached by representatives of the Munitions Board or the armed forces.

Still another executive acquainted with the plan put it this way: "Last time, industry faced the red tape and disturbance resulting from dealing with representatives of both the Army and Navy. Unless the merger becomes a fact instead of paper fiction, we shall be faced with the necessity of dealing with the representatives of *three* jealous services. The Munitions Board's plan, *as it now stands,* will not provide the centralized procurement for which there is such a desperate need."

The only possible conclusion that FACTORY can draw from such conflicting statements on the part of the Munitions Board and of men acquainted with the Board's plan, is that the secrecy which accompanied the development of the allocation and procurement

plan is damaging both industrial morale and the progress of national security. Persons in close touch with the Munitions Board point out that a public airing of the problems attendant on planning industrial mobilization might have brought a shower of criticism on the Munitions Board and the armed forces, and thereby slowed the planning process. While this may be true, the indications are that the advantages of secrecy have been more than offset by the resulting rumors and disturbance of industry.

SOMERVELL PROPOSES ACTION NOW

GEN. BREHON SOMERVELL of the Army Service Forces, and now president of Koppers Company, Inc., sums up his company's position in what FACTORY considers to be the best appraisal it has seen to date of the industrial mobilization situation:

"In an interview published in FACTORY last August, I called attention to the need for industry to act now to help prevent a third world war.

"Since that time much has happened. On the industrial front, we have seen the passage of the National Defense Act of 1947, and, pursuant to that Act, the establishment of several Advisory Committees on Industrial Mobilization. The over-all Industrial Mobilization Plan has reached a more advanced stage.

"The Munitions Board is now planning to survey some 22,000 to 25,000 plants in the very near future with a view to allocating them to the various armed forces in the event of an emergency.

"As I pointed out ten months ago, industry should not only cooperate in this task, but must take the lead *on its own initiative* if the job is to be done well and ON TIME.

"Specific plans by means of which individual companies can assess their own industrial mobilization potential are described in this issue of FACTORY. One of those plans, used at Koppers, has brought us to the point where, I feel sure, we are prepared to meet our obligations to the nation in the shortest possible time, should we be called upon to do so.

"The type of internal survey used here at Koppers has had other advantages, too. Beside helping to promote industrial mobilization readiness, it has disclosed previously unthought-of opportunities for strengthening and improving our normal operations.

"Industrial leaders will do well either to improvise a specific plan of their own, or to adapt to their particular needs one of the plans outlined, *and put it to use at once.* The result can only be a stronger and better-prepared nation, and an improved competitive position for the individual company."

THE KOPPERS PLAN

FOLLOWING the principles outlined in General Somervell's article, the Koppers Company, Inc., Pittsburgh, last fall embarked upon a full-scale industrial mobilization survey of all of the company's 55 plants and divisions. The basic questionnaire used for this survey contained 28 questions to be answered by the manager at each plant. For management purposes, the plant reports were consolidated by divisions. Finally, a summation embracing all operations was made to show the situation from an over-all company point of view.

It should be noted that Koppers envisions the industrial mobilization survey as a *continuing* operation; it will be revised, supplemented, and brought up to date each year. Several additional points are already under consideration for the 1948 revision.

Some of the executives with whom FACTORY has discussed the Koppers plan raised the objection that an internal survey of this scope would require more time and effort than they felt they could justifiably invest. Koppers foresaw this as a possible objection within its own organization. The answer was for a "home office representative" to make a sample survey of one of the plants. When the final questionnaire was forwarded to managers, it was accompanied by the completely worked out sample.

For other industrialists who may wish to see a completed questionnaire, Koppers has prepared a special edition from which has been deleted only those figures regarding production and sales that are necessarily confidential.

Almost without exception, the executives to whom FACTORY showed this sample survey expressed surprise and pleasure at the relative simplicity of what they had previously regarded as either a burdensome or next-to-impossible task.

THE CINCINNATI PLAN

UNDER the unofficial sponsorship of the Cincinnati Post of the American Ordnance Association, presidents of six companies from Southern Ohio and Louisville met in late April to plan group action on industrial mobilization. First step was for each of the six to agree to make a mobilization survey of his plant. It was determined to use as a basis for the survey the form provided in "Annex 47" of the Munitions Board's "Operating Procedure."

The group met again in mid-May. Discussion at that meeting centered around ways and means of persuading other companies of the advisability of taking similar measures. As this communique is written, plans are being laid for another meeting to which will be invited representatives of a score or more companies in the "Cincinnati area." At that time, the original six will explain what they have done, why they have done it, and encourage others to follow their example. By including men from cities as far distant as Cleveland and Indianapolis, it is hoped that the idea may "snowball," chain-letter fashion, through the Mid-West.

To date, the Cincinnati group has found only one major flaw in the survey form: It requests "maximum" monthly rate of production in World War II. Because records are frequently based on shipments, wild fluctuations occur. Experience seems to indicate that the "maximum" of a 3- or 6-month moving average is a better index of what can be done again.

ACTIVITY IN OTHER CENTERS

HERE is a round-up of additional industrial mobilization activity, disclosed by FACTORY's survey of manufacturing centers:

Philadelphia. Several local companies evidenced interest in self-surveys following an address by General Minton of Koppers at an April 22 meeting of the local post of the American Ordnance Association. At the time of this writing, primary interest centers in examining the various survey possibilities: "Koppers plan," Annex 47, "and possibly others." W. J. Meinel, president of Heintz Manufacturing Company, told FACTORY that his firm was taking positive action and would be in a position to report its experience to a late-May meeting of the AOA. It was hoped that sufficient agreement could be reached then to organize group action.

Detroit. There is plenty of mobilization activity in the automobile capital. But most of it is under security wraps. FACTORY was able to confirm that representatives of the armed services have been in close and constant communication with industrial leaders; that a careful analysis is being made to determine what orders could be handled without disrupting the production balance in the strike-jittery industry. Beyond that: Nothing but rumors.

Cleveland. A handful of junior executives, brought together through a veterans' organization, are collecting "case material" on industrial mobilization from companies outside the area. Purpose: To be able to demonstrate to their superiors both need and feasibility for Cleveland industry to exercise similar initiative. Specific plan of action: Undetermined.

Chicago. At a meeting of the American Management Association here on May 14, about 10 per cent of the 250 companies represented indicated that they had taken at least "some steps" toward making internal surveys. In answer to FACTORY's question, a member of the Munitions Board attending the meeting said that "about 1600" firms are now "working on" mobilization plans of one type or another, either at the request of the Board or on their own initiative.

Additionally, three large wartime matériel producers are engaged in intensive mobilization studies. In at least one of these cases, the company is "working hand-in-glove" with the Munitions Board.

A fourth and somewhat smaller manufacturer reported to FACTORY that his firm is not only making an internal survey but is currently engaged in actual production of a "trial educational order."

New York. A group of companies in the electronic industries is preparing not only internal surveys but also a complete program of industrial mobilization. Activity to date has been centered largely around the problem of determining the type of survey best suited to the particular industry. FACTORY was told that the present survey procedures of the Munitions Board are "particularly inadequate" as regards the electronics industry, in which current technical progress is so rapid. As their planning progresses, this group, which is working through a special committee of the Radio Manufacturers' Association, hopes to be able to outline a plan acceptable to the Munitions Board, and which will be specifically tailored to the industry.

San Francisco. Mobilization in this area is so far only in the "talking" stage. But many of the civilians, representing 47 plants, who attended the April seminar of the Industrial College of the Armed Forces, are currently meeting in informal sessions to explore what can and should be done. Army representatives report that "several" companies have made offers of cooperation.

Los Angeles. Reactivated about a year ago, the wartime Industrial Mobilization Committee of the Chamber of Commerce has taken the lead in this area. This group has sent questionnaires—actually, abbreviations of form MB-104 in Annex 47—to 8600 companies. Particularly in metal-working industries, heavy emphasis is being placed upon determining inventory of and requirements for skilled workers. Deficiencies disclosed have led the group to urge local industry to implement skill-training programs quickly. Specific plans are now being formulated, and a pamphlet, "Industrial Mobilization Training," will be out soon.

AIDS TO MOBILIZATION PLANNING

The following documents contain information and forms which should be in the possession of companies either considering or actually undertaking industrial mobilization planning:

Annex 47. Blank survey form. Allocation procedures. Instructions for obtaining official assistance, governments orders, etc. Specify: "Military aspects of industrial mobilization, allocation of private industrial capacity for procurement planning of the armed forces, operating procedure; Annex No. 47," *Write:* Munitions Board, Office of Public Information, Washington 25, D. C.

Koppers plan. Completed survey form. *Write:* Gen. Hugh C. Minton, vice-president, The Koppers Company, Koppers Building, Pittsburgh.

Army, Air Force industrial mobilization offices. Complete list in FACTORY, April, 1948. See "Communique No. 3."

Navy industrial mobilization. New Navy procurement and planning set-up described in pamphlet, "Selling to the Navy." Available soon. *Write:* Procurement Policy Branch, Material Division, Department of Navy, Washington 25, D. C.

For further details regarding voluntary activities:

Cincinnati plan. *Write:* W. L. Scott Alter, president, American Tool Works Company, Cincinnati.

Electronic industries plan. *Write:* Fred Lack, vice-president, Western Electric Company, 195 Broadway, New York.

Los Angeles activity. *Write:* Carlton B. Tibbets, president, Los Angeles Steel Castings Company, 2444 South Alemeda Street, Los Angeles.

5,000,000 Youngsters Need Our Help Now

THE bumper wartime crop of babies, about 5,000,000 larger than the population experts expected, is reaching school age.

At school these youngsters should find a good education awaiting them. That is their most cherished American birthright.

But unless something is done quickly, millions of these children will be cheated. They will crowd into classrooms already run on double shifts. They will move in with children who are now sitting two in a single seat. They will read germ-loaded books mangled by a generation of use by grimy hands.

I

So the continuing crisis in American education is given a new twist by unexpected pressure on school plant and equipment.

The U. S. birthrate has jumped by leaps and bounds. Instead of declining in the '40s, as the experts expected it would, the rate climbed from 17.9 per thousand in 1940 to 21.5 in 1943. It jumped to 25.9 in 1947, an increase of 45 percent since 1940. Result—by 1956 elementary school attendance in the United States is expected to jump from 18,200,000 to more than 23,400,000, an increase of about 5,200,000, or more than one-fourth.

The rush has already begun. It will pick up speed next fall.

Now, while this pressure has been building up, our public schools and their equipment have been running down—first through inevitable wartime neglect, then because inflation and material and labor shortages made it difficult to catch up.

If we are to give this bumper crop of youngsters the break they deserve—and reach the educational standards the nation needs—we must speedily do a major job of educational rehabilitation and expansion.

II

Some headway has been made in overcoming the teachers' salary crisis.

Teachers' salaries are improving. Pay problems were driving good teachers away from their posts in droves not long ago. But in the year since the 57th editorial in this series emphasized that crisis, the average teacher's annual salary has increased about $300—from $2250 to $2550.

True, increases vary enormously from state to state and from town to town. In a few states the average increase has been $500; in some less than $100. But, for the nation as a whole, last year's increase put teachers about even in the race with the cost of living. After taxes, their salaries have risen 68%, and the cost of living 67%, since 1939. In terms of pay increases, however, they are not nearly as well off as are industrial workers, whose average weekly wages after taxes have risen 108% since 1939. They are far behind farmers, whose net income is now four times what it was in 1939. And teachers had notoriously low salaries to start with.

A great deal more needs to be done in raising salary standards to put our school system on a firm footing. There are still about 100,000 teachers, nearly 12% of all public school teachers, who hold temporary or emergency credentials. They cannot meet

prevailing standards, and not very severe standards at that, for persons holding their posts.

The salary crisis, however, is easing.

III

But now comes the new crisis in school buildings and equipment.

We would have been hard put to get our schools back into shape after years of wartime neglect—even without a booming birthrate complicating the problem. Right now, 85% of all public school buildings need major remodeling to remove health and safety hazards.

And we aren't building enough new schools to keep up with current needs, to say nothing of catching up on those we were not able to build during the war years. School construction expenditures for 1948 are estimated at $375 million — which is less than what was spent in 1939. With building costs twice as high as they were in 1939, that means we aren't even holding our own—we are falling further behind.

And now comes the rush of war babies.

IV

We must spend at least $11 billion on new schools and equipment in the next decade.

Public and elementary schools must have $6.6 billion. Equally important, another $4.4 billion must be invested in buildings and equipment in our private schools, colleges and universities if they are to meet the demands which will be made upon them. The private school and the privately endowed university are doing their full share and doing it well. The need for them is increasing.

These figures cover only rockbottom needs for educational plant and equipment. But statistics are a very restricted recorder of this crisis.

You can see it better, I'm sure, in schools not very far from your home. There are schools with leaking roofs and outdoor toilets in our greatest cities. There are schools where students still use histories and geographies copyrighted before 1920—books with no mention of World War I, the depression of the 1930's, the Russian Revolution or the rise of the dictators. There are countless schools where modern methods of visual education are completely unknown.

All of these conditions promise to get worse—promptly—as that scheduled 5 million increase in the school population gets rolling.

V

The Metropolitan Life Insurance Company does not indulge in lurid prose. It says after painstaking study of the educational crisis that:

"Unless definite measures are taken immediately . . . large numbers of American boys and girls will be deprived of an adequate education."

Currently we are deeply concerned about our military defenses. We are taking, and I think rightly, emergency measures to strengthen them. But we must regard our schools as a part of our national defense as vital as are our armed forces. This is particularly true in these times of fifth columns and ideological warfare.

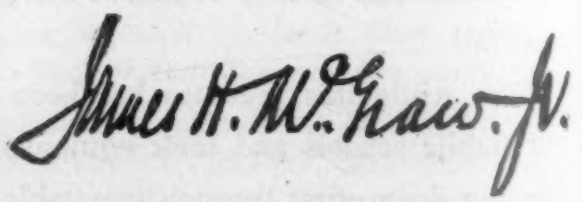
If we are wise, we will raise our sights. We will give the continuing crisis in education the same urgent attention being given the more obvious but no more real crisis in national defense.

Go to the school house in your neighborhood and discover what needs to be done to provide for the rising tide of young Americans. Ask your school board and your school administrators and teachers how you can help them.

That is good citizenship.

That is patriotism.

That is our duty to the oncoming generation.



President, McGraw-Hill Publishing Company, Inc.

FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

WE CAN DO MORE THAN TALK TO OURSELVES

Management so often accuses itself of talking to itself. "That was a mighty fine talk," or "Your editorial really said it," are comments frequently heard at management gatherings. And often it is said, in the next breath, "But the man in the shop is the one who should get that message. Here, we are just talking among ourselves."

I want to defend this procedure of talking to ourselves, and at the same time urge that we do something more.

Ninety-nine times out of a hundred, the subject of a talk among ourselves is economic. We state the case for free enterprise, or we prove the need for more production, or we point out the necessity for greater output per man-hour. We talk of the wage, price, and profit relationship. Or we relate standard of living to efficient production and distribution.

It is well that we talk to ourselves about these matters. We had better be sure of our facts and our own conclusions before we try to give the message to the man in the shop.

Can We Answer These Questions?

How high is our standard of living? In what units do we measure it? What are the bases of comparison with other countries?

What has been the relationship of costs to prices? Of prices to sales? Of sales to quantity production?

What has been the take of labor in our industrial system? Of management? Of capital?

Do machines destroy jobs? Or create them? What should be done concerning technological unemployment?

How much security can there be for labor? For management? For capital?

These questions are intended as suggestive rather than inclusive. They indicate an area in which assertions can be strictly unconvincing unless supported by statistical fact and logical explanation. The American plant operating executive, busy as he is with production problems, must participate in a lot of discussion concerning them, in order to be on safe ground. Which is why I say we should continue to talk among ourselves.

What More We Can Do

When I say we can do more, I mean that once we really know what we are talking about, we can tell the man in the shop. We can tell him directly, and a lot at a time, if we have been accustomed to telling him things directly. Or we can tell him indirectly, and not too much at a time, if we have *not* been in the habit of telling him anything. We can do this by the usual means—personal talks, publications, educational classes.

We can also enlist the help of opinion-formers outside our own ranks. We can tell the facts to teachers, to preachers, to local editors. These people want the facts, and they want the proof back of the facts.

I admit that what I propose is difficult, though it sounds easy. But the goal is worth a big effort, both in more talking among ourselves, and in doing something more than talking.

L. C. Morrow

MACHINE TOOL SHIPMENTS • 1929–1947

(DOMESTIC AND EXPORT SALES)

What the chart means. Despite a sixfold increase in annual volume from $200,000,000 in 1939 to $1,320,000,000 in the peak war year of 1943, the machine tool industry never did really complete the job of tooling up America's war production drive.

Because of the increase in prices, today's volume of $300,000,000 a year probably represents only a small increase over 1939 in the actual number of machine tools. Similarly, today's theoretical *capacity* of $600,000,000 is considerably less than one-half the actual production required in the peak war year.

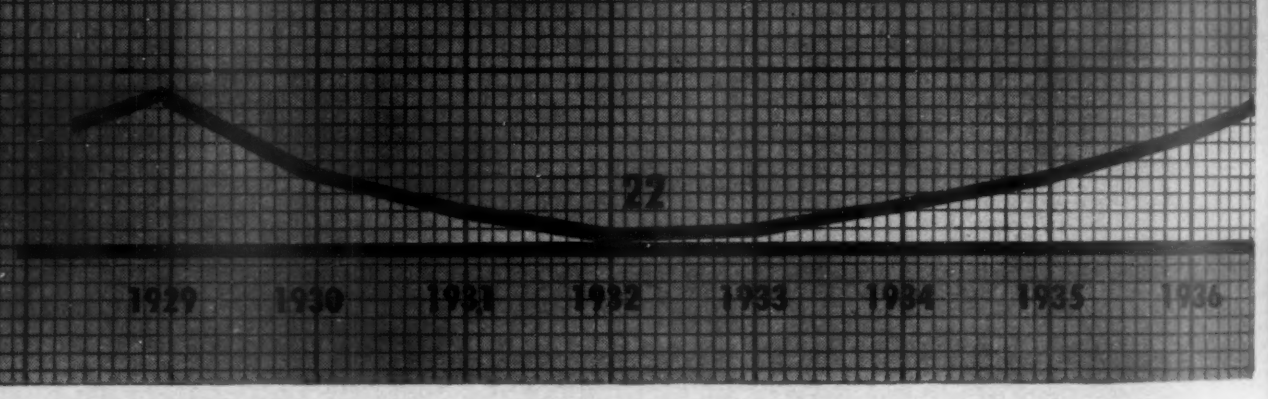
That means that if a similar number of machine tools were required in another war, we should once more have to go through the time-consuming process of expanding the industry.

But we might not have the time.

What we are doing about it. Government agencies are giving the problem some serious study. A limited stockpiling program has been undertaken.

What should be done about it. Stimulate production and installation of additional tools. Step up the stockpiling program. Revise fiscal policies to make replacement of worn-out tools more attractive. Assemble and make public more accurate and up-to-date information on the state of existing machine tools. Place more emphasis on machine tools under the Marshall Plan. Do more long-range planning to prevent recurrence of World War II mistakes.

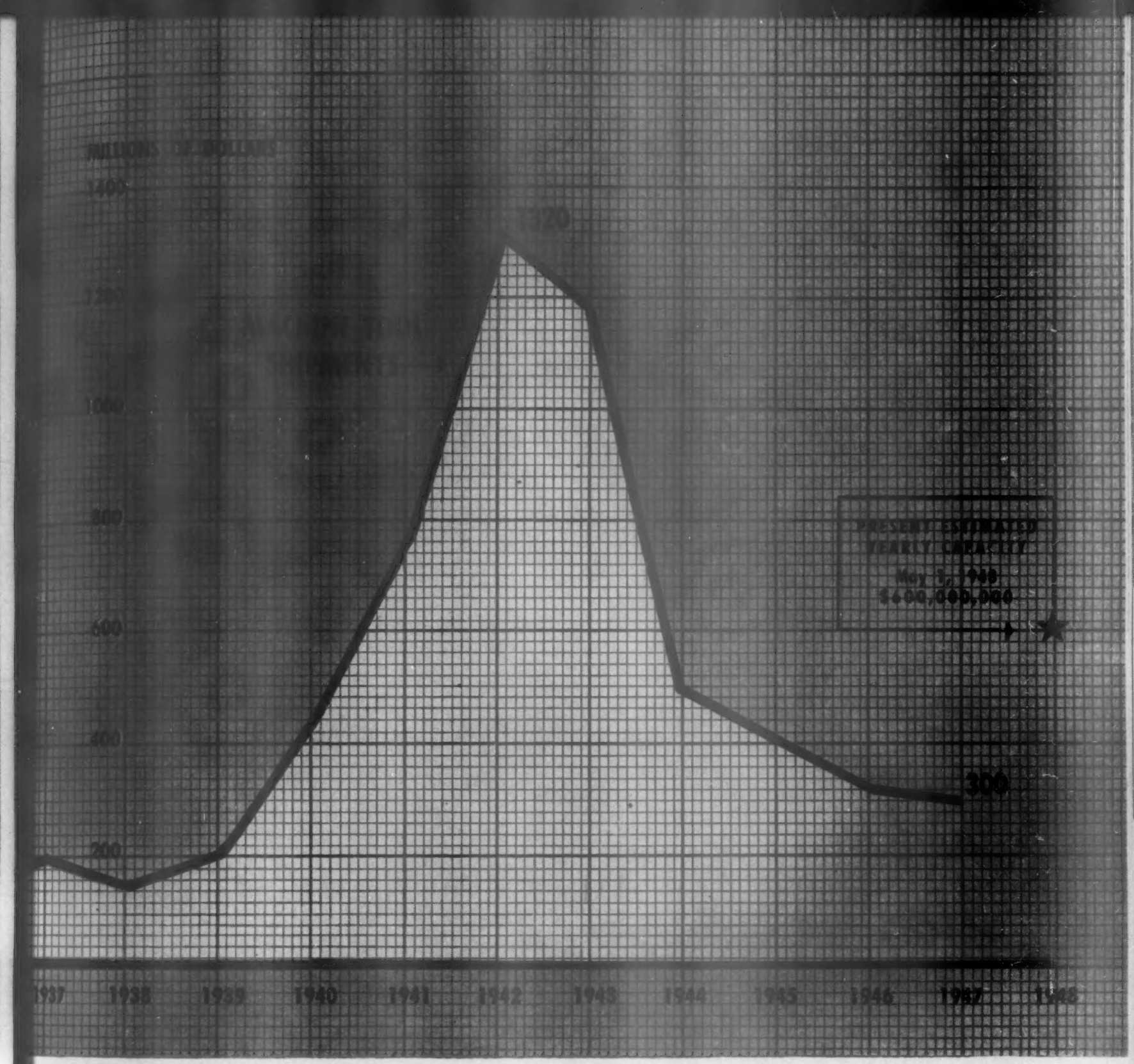
Figures 1929–1940 estimated from reports to National Machine Tool Builders' Association; 1941–1945, War Production Board



INDUSTRIAL MOBILIZATION COMMUNIQUE NO. 5

WE MUST BE SURE OF OUR MACHINE

Machine tools were one of industry's biggest bottlenecks of World War II. If another war should come, they might again be industry's No. 1 problem. ★ We never did complete the job of tooling up in the last war. That must not happen again. It can be prevented by stepping up production, building a reservoir of new tools now. ★ While a stockpile would be necessary, many of the tools could be put to work now producing more goods at lower unit costs. ★ The picture is not all black, although sane analysis shows that we have far too few machine tools to insure national security



TOOLS FOR NATIONAL SECURITY

THE MACHINE TOOL INDUSTRY: Is it ready to tool up America's economy for another war, should this be necessary in the foreseeable future?

The answer is yes—*with qualifications.*

1. How many machine tools will be needed?
2. What will be the potential of the industry at the time of the emergency?
3. How long will it take for the industry to reach maximum production?
4. What will be the effect of the Marshall Plan?

Not one of those questions has a simple answer. Yet each *must* be answered if we are to be able to appraise the machine tool situation in the event of an emergency. Action *now*—based on a clear understanding of the problem—can eliminate some of the qualifications and help insure national security.

A complete discussion of the four qualifications listed will be found on the pages that follow

AT MARIETTA, GA., MACHINE TOOLS ARE PUT IN "MOTHBALLS" AND STOCKPILED IN ORDER TO PROVIDE BUFFER SUPPLY FOR

1. HOW MANY MACHINE TOOLS? Lack of up-to-date information about number and condition of existing tools complicates the picture of what remains to be done

NOBODY KNOWS for certain what type of production would be required. Requirements must be revised with each new advance in the technology of war. Moreover, much information of this type is classified as top secret. Men in position to evaluate the machine tool industry's potential are not given the facts about new materials required until orders are released.

Experience in World War II proved that such procedures were disruptive, and resulted in less production than could have been achieved with better advance planning. Just how disruptive no one can say, and opinions differ.

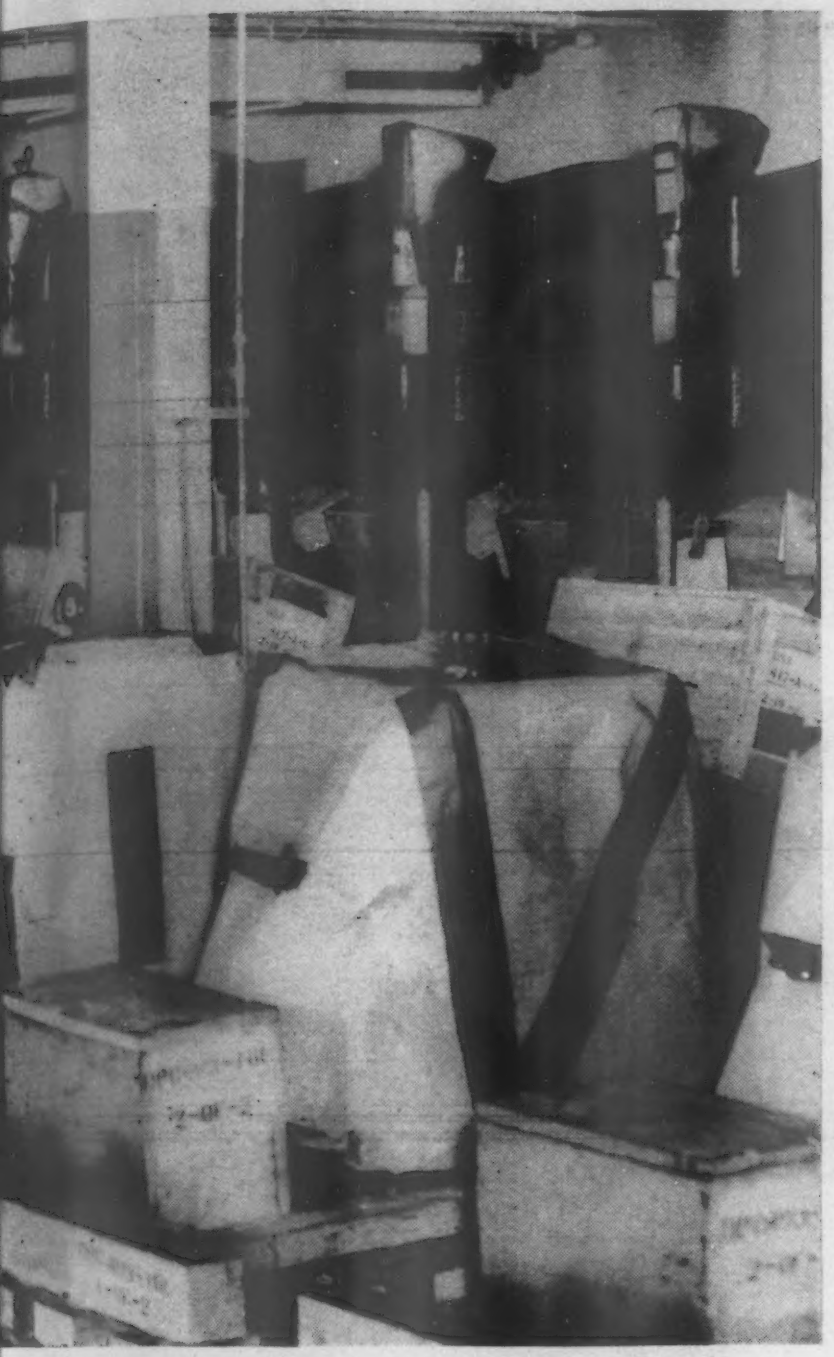
An outstanding example was the now-famous proximity fuse. Without any previous warning to either the machine tool or producing industries, the ordnance department in a single day ordered 5,000,000 proximity shells for delivery by a certain date. The machine tool industry was besieged with orders for special machines, every order carrying unlimited priority. Some people in the industry estimate that had the machine tool builders been given 90 days' notice, regular production would have been interfered with much less, and *total* machine tool production in the ensuing year would have been increased by 5, possibly 10, per cent.

Nobody knows for certain how many machine tools will be on hand when emergency is declared.

The required calculation is not simple.

Condition of the machine tools currently in use by industry is a factor. Obviously, many changes have taken place since 1945, when the last authoritative figures were published by *American Machinist*. The net effect of those changes can only be guessed at.

In 1945, when the most recent survey was made, United States industry (including Army and Navy arsenals and government-owned plants) had 1,711,137 machine tools in place, of which 827,431 had been built



FUTURE EMERGENCIES. GOAL OF 92,000 IS FAR TOO SMALL

and installed since 1940. This latter figure does not include the 121,404 tools produced for export. About 600,000 tools, or one-third of the total, were government owned. It is estimated that an additional 175,000 machines were built in 1945-7. At least 54,000 tools were exported in the same period.

While some of the post-1940 tools have been retired, scrapped, or shipped abroad, the added production since 1945 almost certainly means that upwards of 750,000 machine tools now in use or in stockpiles are less than 8 years old. This represents a big improvement over 1940, when there were only 276,165 tools less than 10 years old out of a total of 1,000,112.

It cannot be overlooked, however, that during the 5 years of three-shift operation in World War II, many machine tools were used the equivalent of 1½ to 3 years in 1 year. Furthermore, wartime maintenance was frequently below par, and many operators were inadequately trained. The result is that age in terms of years is not an accurate index of the present utility of industry's newest machine tools.

The comparative picture of 1930 and 1935 shows what can happen in even so short a period—if it happens to be a depression period. During that time the number of machine tools *less* than 10 years old dropped from 572,748 to 359,849 while the total number of tools in place decreased almost 60,000, leaving barely more than a million in operation. The potential danger to the machine tool phase of America's preparedness program in the event of another depression is obvious.

Future replacement rate of machine tools now in use has to be considered. Obsolescence must be taken into account. So must the fact that post-World War II tools surpass old ones in terms of production per hour, some by as much as 500 per cent. One spokesman for the industry says the over-all average increase is of the order of 30 per cent. If the historic pattern is followed—and there is no reason to believe it will not be—these machines will bring about lower unit costs of industry's goods. Demand will increase. Capacity will be expanded. The number of additional machine tools in use by a given date cannot be accurately forecast.

Faster Depreciation Rate Needed

Under present conditions, it seems unlikely that *replacement* programs will be carried out on any broad scale. A purchaser of machine tools can claim tax credit for depreciation at an average rate of only 5 per cent per year. That means it takes about 20 years to write off a machine.

Machine tools purchased with the inflated currency of 1948 might have to be "paid for" with greatly deflated dollars during some or all of the 20-year period. If, on the other hand, the purchaser of machine tools is permitted to write off the full value during a period of high prices, the replacement rate will rise sharply. One key figure in the industry estimates that if the period of depreciation were cut to two years, the replacement rate would more than double; if cut to one year, the rate would at least treble or quadruple.

The present low replacement rate is contributing to low volume of machine tool production, the retention of fewer skilled workmen, and insufficient technological development in machine-tool-using plants.

Failure to replace with more efficient machines *before* an emergency will increase tremendously the requirements for additional machines *during* the emergency.

On this matter of depreciation Sweden's experience is worth noting. A well-informed neutral observer reports that, because Sweden permits 1-year depreciation of machine tools, the machine tool industry in that country is retooling to a point technologically far in advance of the American machine tool builders. Similarly, the depreciation policy is leading all Swedish industry to retool at an unprecedented rate.

Is There a Black Market Stockpile?

Disposition of replaced machine tools is a third influence. Many of the machines being sold ostensibly for scrap are finding their way to second-hand dealers. They are being held—speculatively—against some possible time when they will again command a high price. This is particularly true of the thousands of tools declared surplus at the close of hostilities of World War

II. As a single example of this type of operation, 500 vertical die-sinking machines (original cost, $25,000 each) were purchased as "scrap" last year. Although no one will venture a flat statement, there is much talk to the effect that these machines have been placed in storage, rather than melted down. It is impossible to estimate how many tools are in this speculative stockpile, but guesses range as high as 50,000.

Limited Stockpiling Under Way

Government stockpiling is an influence. Under the industrial mobilization program, the Munitions Board has been authorized to set aside some 92,000 machine tools, of both standard and special-purpose types. However, that is only a first goal, and is subject to revision upward or downward. In addition, there are an unknown (to the public, at least) number of machine tools in arsenals, in navy yards, and in government-owned plants which are adjuncts to manufacturing establishments, in which the equipment has been put in a ready condition. But even at the most liberal estimate, this is still a small number in relation to the 948,835 tools built for military purposes during the second World War.

Time and obsolescence are also important in connection with stockpiling. There is considerable feeling in the machine tool industry that, unless war comes within the next three to five years, virtually all the tools now being stockpiled will be obsolete for purposes of really high production. However, they will still be usable as stopgap machinery, and will give the nation an initial advantage in not having to expect miracles from a swamped machine tool industry.

Another question mark in connection with government stockpiling is the policy that will be followed in renewing the stockpile. General-purpose machines, by and large, will not soon require replacement in the stockpile by technologically more advanced machines. Special-purpose machines, on the other hand, become obsolete far more rapidly, either through improvement in machine design, or because of drastically altered machine requirements resulting from changes in process or changes in end products required. Seen in this light, there is a definite need for a frequent review of the stockpile.

Nobody knows for certain what volume of war goods will be needed. The volume varies as the demands of war change. The size and quality of the stockpile will, of course, have an important bearing on the problem.

And the experience of World War II poses an interesting question with a direct bearing on this aspect of the problem. How many machine tools, *in excess of actual production needs,* will have to be produced? The record of World War II in this respect is not too good. Here are some cases in point:

Contractors frequently ordered more machine tools than were actually needed for the job, especially in the early days of the war. As one example among hundreds, 35 worth-their-weight-in-gold gear shapers spent the entire war in packing cases in a Brooklyn plant. The excuse was that they might be needed; if they were, the work was of such high priority that the firm could not take the chance of a delay in delivery.

Many firms set unnecessarily early delivery dates, and then put tremendous effort into expediting the deliveries. Examination frequently showed that whole plants for which tools had been ordered, would not be in operation for several months after the tools were delivered. Although not so extreme, the same situation occurred in already established plants.

Altogether too many manufacturers ordered machines with all possible attachments, whether or not the attachments were required for the particular job.

The question of how many tools will have to be produced in another emergency is tied closely to the question of whether or not such practices can be eliminated in the future. Many of the leaders in the machine tool industry take a rather pessimistic view of this situation. A common reaction seems to be that in the *early* stages of a war production drive, this problem would be minimized. However, as the armed services began to exert pressure for ever-greater production, it is held likely that producing companies would resort to these wasteful tactics as a matter of *individual* self-protection—even though the *collective* effort would be impaired.

One thing is certain: As long as war lasts, new requirements will keep coming up. New weapons will have to be built, and unsuspected quantities will be called for. There is no possibility that the industry can tool up completely for war production as of a definite date and then go ahead with other work. Diversion of machine tool plants to the manufacture of other equipment is a risky move.

Two Suggestions for Stockpiling Machine Tools

1. Stockpile by process. All machines necessary for production of a particular item or type of item would be stockpiled under a single inventory number. As design or other requirements changed, or as better machines became available, individual substitutions would be made within the "process unit" to keep it instantly ready to function at peak efficiency.

2. Stockpile only new tools (rather than surplus tools, as are many now being stored). Would provide a stockpile of the very latest and most efficient machines. Some intimate that, to realize the fullest benefit, the entire stockpile should be renewed every five to ten years, with the "freed" machines being sold to industry at bargain rates. The argument is that this would keep the machine tool industry busy building new machines for the stockpile, while parts industries would be able to undertake a substantially greater modernization program than would be possible within the present price structure. Primary benefit, some proponents admit, would be keeping the machine tool industry strong rather than increasing the worth of the stockpile.

2. WHAT WILL MACHINE TOOL POTENTIAL BE? Loss of subcontracting facilities and price increases have cut the industry's potential to far less than half its war peak

IT TAKES MACHINES to build machines. In a third world war, the first problem would be to build machine tools for the machine tool industry. At the peak of World War II (1942-3 for the machine tool industry), production was at the rate of about $1,320,000,000 per year. Of that amount, roughly one-half was accounted for by subcontractors and special war facilities. Since these are now totally out of the picture, the present capacity of the industry is about $600,000,000 per year. Actual production is at just about one-half that rate. If price increases are taken into account, current production, *in numbers,* is still smaller in relation to the peak.

Part of the $600,000,000 capacity might be lost to the machine tool industry in the event of another war. The reason is that some of the machine tool companies have gone over to producing non-machine tool items, many of which would be classified as essential. On the other hand, in time of war many non-machine tool plants make machine tools. The key to the problem lies in having the right man at the control point.

The machine tools being produced today are the most efficient ever, but a good many of the machine tools being used to produce them are not of latest design. While that condition is not universal, one impartial authority avers that it is true of at least 45 per cent of the machine tools now in use in the machine tool industry. The condition exists because replacement is financially unattractive.

In any emergency, the critical element is bound to be *time.* It has always taken a long time to produce machine tools. That time must be shortened. Greater use of its own new tools by the machine tool industry would help. Estimates of possible savings in production time resulting from use of new tools and application of advanced technology run as high as 25 per cent for the industry, 50 per cent in some specific instances.

3. HOW LONG TO REACH MAXIMUM PRODUCTION? It took over 3 years last time. Only careful, long-range planning can reduce that period in another emergency

STARTING IN 1939, when the first flood of World War II orders was placed, it was not until 1942 that the machine tool industry reached peak production. Thus it took almost four years to complete the job of tooling up American and (to a lesser extent) British industry. As a matter of fact, it never did reach the point where it was not struggling to turn out new machines required by the latest war demand.

To shorten the period of getting under way, in the event of another war, there are additional things that can be done, or planned, now.

Repeal of Treasury Regulation 102, the 35 per cent surtax on undivided profits. Fear of this regulation has acted as a considerable restraining influence on manufacturers who might otherwise have plowed back virtually all their profits into plant expansion. While difficult to measure in terms of either percentage or units of production, such a move would be certain to have a salutary effect on any concerted drive for production of war-tools.

Recognition by Selective Service of certain types of jobs in the industry as essential. During the recent war, classifications of industry personnel were changing constantly. Frequently there was no forewarning of such changes, and the resulting dislocations were severe. This was particularly true where a local board would deviate from what was generally considered a pattern and suddenly call up men who had previously been deferred—and whose counterparts in other areas continued to be deferred.

A clear, permanent definition, at the outset of any future draft, of the types of men to be deferred, would aid greatly in preparing the industry to meet production goals despite the loss of men to the services.

However, some companies had particularly fortunate experiences in dealing with local draft boards. Not unnaturally, representatives of those companies would prefer to see the local boards left with a maximum of discretion in the matter of deferments.

Institution, early in any emergency, of an effective and efficient priority system. The priority scheme in the past war finally evolved into a generally understood and, for the most part, workable system. But for almost two years it was in a hopeless tangle. A great fear in the minds of some in the machine tool industry is that the tested plan will be junked and new theories tried while valuable time is lost. They recall that CMP (the Controlled Materials Plan) came only after bitter experience—but that it was carefully outlined in the discarded industrial mobilization plan drawn up by E. R. Stettinius, Jr., in 1939.

Industry Might Be Subsidized Two Ways

Government subsidies of the machine tool industry. Subsidies to the industry are unlikely, and the feeling in the industry is that they would have little, if any, beneficial effect. But there are two procedures that the government could follow which would aid materially in spurring production.

One is the erection of standby plants *prior* to a period of emergency, which could lessen the burden of immediate pre-war expansion. Such a program would merely be a peacetime extension of the government defense plants of World War II.

The other is educational orders, financed by the government, which would be of greater benefit to producing industries than to the machine tool builders, but leaders in the industry believe that the long-run

advantage would be great. First, it would give the parts industry an idea of the types of tools that are going to be needed. Second, it would allow the parts industry to sit down with the machine tool builders and discuss these production problems while there is still time.

At this point pooling of orders, also, should be mentioned. The practice was followed during the war. The government placed orders for machine tools which were to be made for a pool. The manufacturers filled orders from that pool. Machines not sold were the property of the government. The advantage is obvious: The machine tool builder can put through larger lots than if he had to build only machines for which he had firm, non-government orders. This procedure could constitute one form of stockpiling.

4. WHAT OF THE MARSHALL PLAN? No specific provision was made for machine tools. But Europe now seems likely to get a limited number. U.S. will gain two ways

PUTTING EUROPE BACK on its economic feet will require shipment of thousands of machine tools to the continent. How many tools has not yet been determined, and probably never will be as a lump sum. This for the reason that the Marshall Plan, as such, will not provide tools for Europe. According to the State Department, machine tools will have to be furnished to individual companies through the Export-Import Bank. It is the policy of the Export-Import Bank to grant loans only when reasonable security is available which means that ERP nations must look elsewhere for most of their machine tools.

However, the Economic Cooperation Act, in the form in which it was finally passed, provides close to $2,000,000,000 to be spent for unspecified items. It is the interpretation of many in Washington and in the machine tool industry that any part of this amount could be spent for machine tools if Paul Hoffman, ECA Administrator, should choose to do so.

Europe May Get $100,000,000 In Tools

Latest advices from Washington indicate that the first 15 months of the Marshall Plan will see roughly half a billion dollars' worth of all types of machinery sent to Western Europe (plus China). Responsible sources would venture only an "unreliable" guess that perhaps 20 per cent of this, or perhaps $100,000,000, would be in form of machine tool shipments.

On the whole, students of this situation say that ERP nations need $150,000,000 worth of machine tools to fill their basic requirements. A considerable part of this demand already is in the form of orders held by American selling agents in Europe. The orders cannot be filled because of the lack of dollars. Government loans negotiated through the World Bank also could be used for such purposes. It should be pointed out that in the past the machine tool industry has had to sell 15 to 20 per cent of its annual production abroad to stay in the black.

Every machine tool sent to Europe will have a bearing on the machine tool situation in another war emergency. Unlike domestic sales of machine tools—most of which will be replacements—virtually every tool sent to Europe will represent an addition to the existing inventory for use in war production. Presumably, few if any of the tools sold to Europe will find their way behind the Iron Curtain—unless the countries receiving them are taken over as was Czechoslovakia.

The general feeling in the machine tool industry is that the Marshall Plan is placing too great emphasis on consumer goods. Few deny that in the early stages of the program the primary emphasis must be on food and such other consumer items as are necessary to prevent starvation and complete collapse. But the general belief is that if the United States sends the equipment with which to tool up and repair factories, transport, and communications, Europeans will be able to do the rest of the job for themselves.

This would have two additional advantages:

It would cut the total cost of the Marshall Plan (and the resulting tax drain on American individuals and business) by bringing Europe more quickly to a position of self-support, and to the point where it could once again become a cash customer of American industry.

And it would add the weight of a revitalized European industry to the war potential of the Western democracies.

Commenting on the consumer goods *versus* industrial facilities aspect of the Marshall Plan, one spokesman for the machine tool industry said:

"We are sending them water when what they need is a pump."

★ ★ ★

TO SUM UP: Government fiscal policies make replacement of present machines with new and more efficient ones quite unattractive. As a result, many worn-out or technologically obsolete tools are still in use. This is true in the machine tool industry itself, and operates to limit sharply the potential of the industry.

As of today, there is nothing to prevent recurrence of the same tragic mistakes we made in World War II. Some plans are being made to improve this situation, but they are proceeding too slowly.

The present stockpiling goal is 92,000 tools. The Munitions Board wants this doubled. But unless it is made profitable for private industry to undertake a vast program of replacement and addition of machine tools on its own, the doubled goal would still fall short of the mark.

Machine tools cost money. Enough machine tools to support a war production drive would cost a lot of money. But, no less than strategic materials and airplanes, machine tools mean national security.

SOMETHING FOR EVERYBODY IN THIS TRAINING PLAN

Wide variety of in-plant and extension courses increases on-the-job production and helps build future supervisors

ERNEST C. BARTELL • MANAGER OF TRAINING, MERCK & COMPANY, INC. RAHWAY, N. J.

THE training program at Merck ranges from on-the-job instruction for rank-and-file employees to courses such as advanced physical organic chemistry for post-doctorate training of scientific personnel.

One of the most useful training projects is orientation. All new employees at the main plant in Rahway receive this training at several 2-hour meetings. They learn the history of the company, place of the company in the chemical industry, products manufactured and their uses, functions of various company divisions, size and location of plants, and personnel policies and employee benefits.

The new employees are divided into three groups: Those on the hourly payroll, technical employees, and all other salaried employees.

The Merck training department also is called upon to handle problems that arise from day to day throughout the plant. This emergency function is called "spot training." For example, training was provided for electricians installing wiring in a new situation; for inspectors of packaging for a new product; and for manufacturing supervisors working with new pressure vessel safety codes.

Briefly described below are four of the major divisions of the training program.

SUPERVISORY TRAINING

Until recently, training courses for supervisors lasted as long as 18 weeks. The training department found, however, that short tailor-made projects of immediate value are better than longer programs of general or indirect benefit.

For example, all supervisors study the union contract each year at two 2-hour meetings. These sessions are long enough to acquaint supervisors with contractual changes. The men also attend four meetings on salary administration policy.

Supervisors in charge of packaging and shipping learn about the wage incentives in that division.

Mechanical department foremen attend meetings on foremanship and recent technical developments in the field of chemical production equipment. Another program covers the Taft-Hartley Act.

ON-THE-JOB TRAINING

A real challenge arose with the rapid development of a major new product, streptomycin. Persons employed for two extremely delicate operations—weighing and packaging this new antibiotic—must learn sterile techniques and the incentive bonus system. These two points are covered by a one-week vestibule school. Teaching methods include home-made and commercial movies, live models, lectures, sound slides, and the old-fashioned blackboard. Other programs of this kind are organized as the need arises.

JOB-RELATED COURSES

Adult education is sponsored at The Merck Training School, and at nearby colleges and schools. Since 1942, when The Merck Training School was established as a war measure, 1453 employees have been enrolled in 40 different courses. The school presents job-related subjects to those who are anxious to improve their work performance.

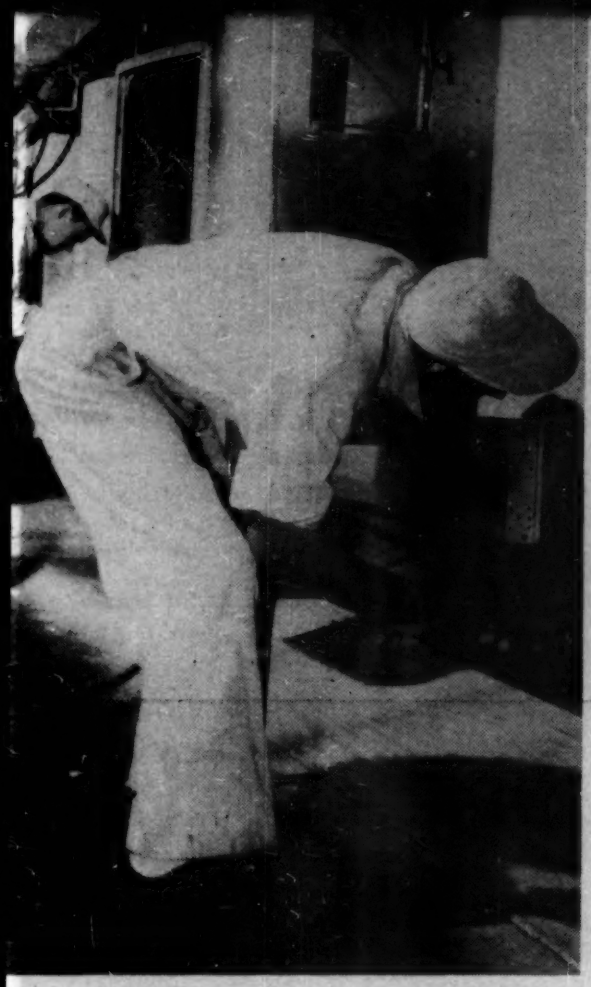
Students go to school on their own time, after hours. Information given is often not of direct value to employees in their work; however, both the company and the employees benefit because the courses stimulate and broaden the students.

Several years ago, a formal program for paying tuition charges at nearby schools and colleges was inaugurated. This was intended to foster study of work-related subjects not in the training school curriculum. The company pays tuition charges up to $100 for a school year, having found this sufficient for most full-time employees who attend evening classes at their leisure. About 200 people take advantage of this program each year.

JUNIOR EXECUTIVE TRAINING

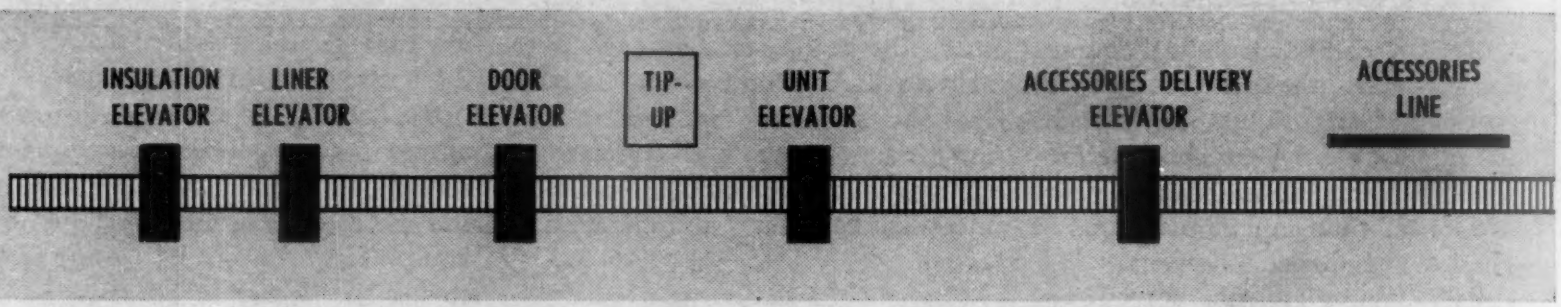
This program calls for bringing in a limited number of young college graduates each year and rotating them through various divisions of the company.

After a period of not more than a year, the men are placed on what might be called permanent assignments, but the training department follows them closely for another year, or until they have become fairly well established in their work. Thereafter, if the men are not progressing satisfactorily, the training department undertakes to uncover the reasons. This program is separate from the recruiting program for technically trained graduates.



CABINETS PAINTED WHILE IN MOTION . . .

VERTICAL LIFTS DELIVER PARTS TO POINT OF USE ON MAIN ASSEMBLY LINE . . .



IDEALIZED LAYOUT OF FINAL ASSEMBLY LINE SHOWS HOW PROGRESSIVE FLOW IS SERVED BY VERTICAL LIFTS WHICH DELIVER

STRAIGHT-LINE ASSEMBLY SERVED

Space is conserved, confusion eliminated by conveyors on two levels. Vertical lifts provide interfloor exchange

J. M. SCARLETT • SUPERINTENDENT, CABINET ASSEMBLY, GENERAL ELECTRIC COMPANY, ERIE, PA.

An increase in output amounting to almost 40 per cent above the previous level was the goal set by General Electric for its Erie plant. To assure against pricing itself out of competition, which could easily have happened with the greatly increased materials and labor costs, orders to the plant layout department were to mechanize every possible operation and to eliminate, or simplify and combine; operations wherever it was possible to do so.

Three aims were established:

1. To perform all possible handling and assembly operations on conveyors.

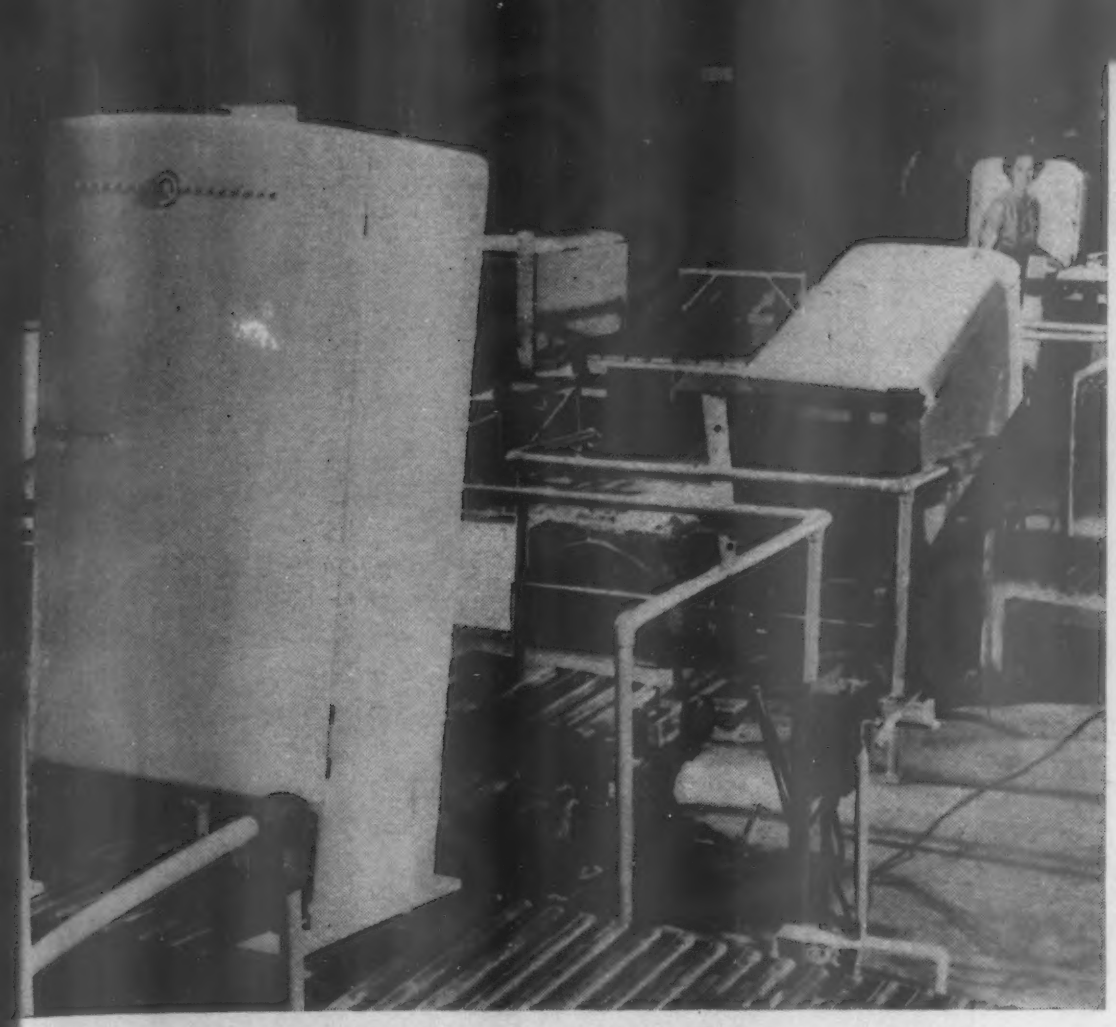
2. To arrange conveyors in such sequence that fabricated parts, once they had been placed on the first conveyor, would be in continuous production until final assembly.

3. To avoid confusion by eliminating storage of material at or near the three final assembly lines.

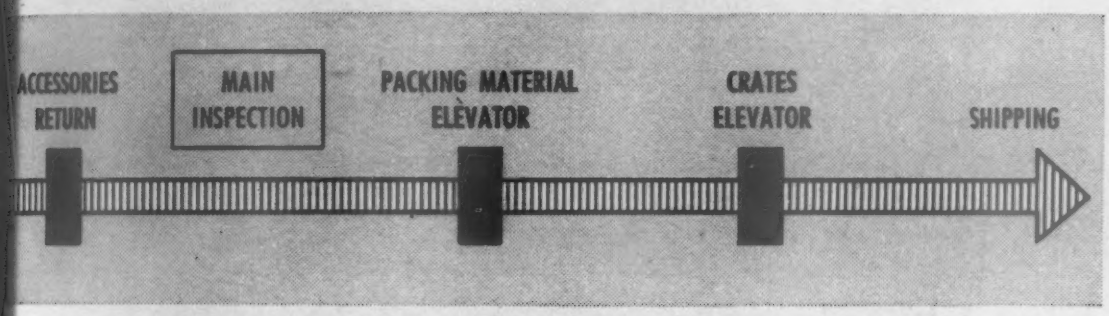
Overhead conveyors are used to carry the fabricated parts through the bonderizing tanks which are located on a special platform built in the "air-space" above the fabrication operations. Overheads also carry each part through its own enameling, baking, cooling cycle.

Flat bed and roller conveyors are used for the subassembly operations on the first floor.

Vertical lift conveyors deliver insulation, inner liners, outer doors, accessories, and shipping materials to the assembly floor at the point-of-use for the particular item.



ALMOST-FINISHED BOXES TIPPED UP AUTOMATICALLY FOR FINAL OPERATIONS



COMPONENTS AT TIME AND PLACE NECESSARY TO KEEP LINE IN MOTION

BY ELEVATORS

Three major slat-type assembly lines, each subdivided into three synchronized sections, serve the main assembly operation.

Loaded as Two Units

Fabricated parts that require bonderizing (doors, cabinets, and upper panel) are loaded on conveyors in groups of two complete refrigerator units. The sequence of loading is as follows: The upper panels are loaded on the first hook; the second and third hooks carry one cabinet each; two doors are hung on the fourth hook.

Because of the difficulty of holding bonderizing conditions constant, it is desirable from a quality standpoint to combine (in assembly) doors, cabinets, and upper panels that were bonderized at the same time. Thus, the two complete units (from four successive hooks) are stamped with the same serial identification number.

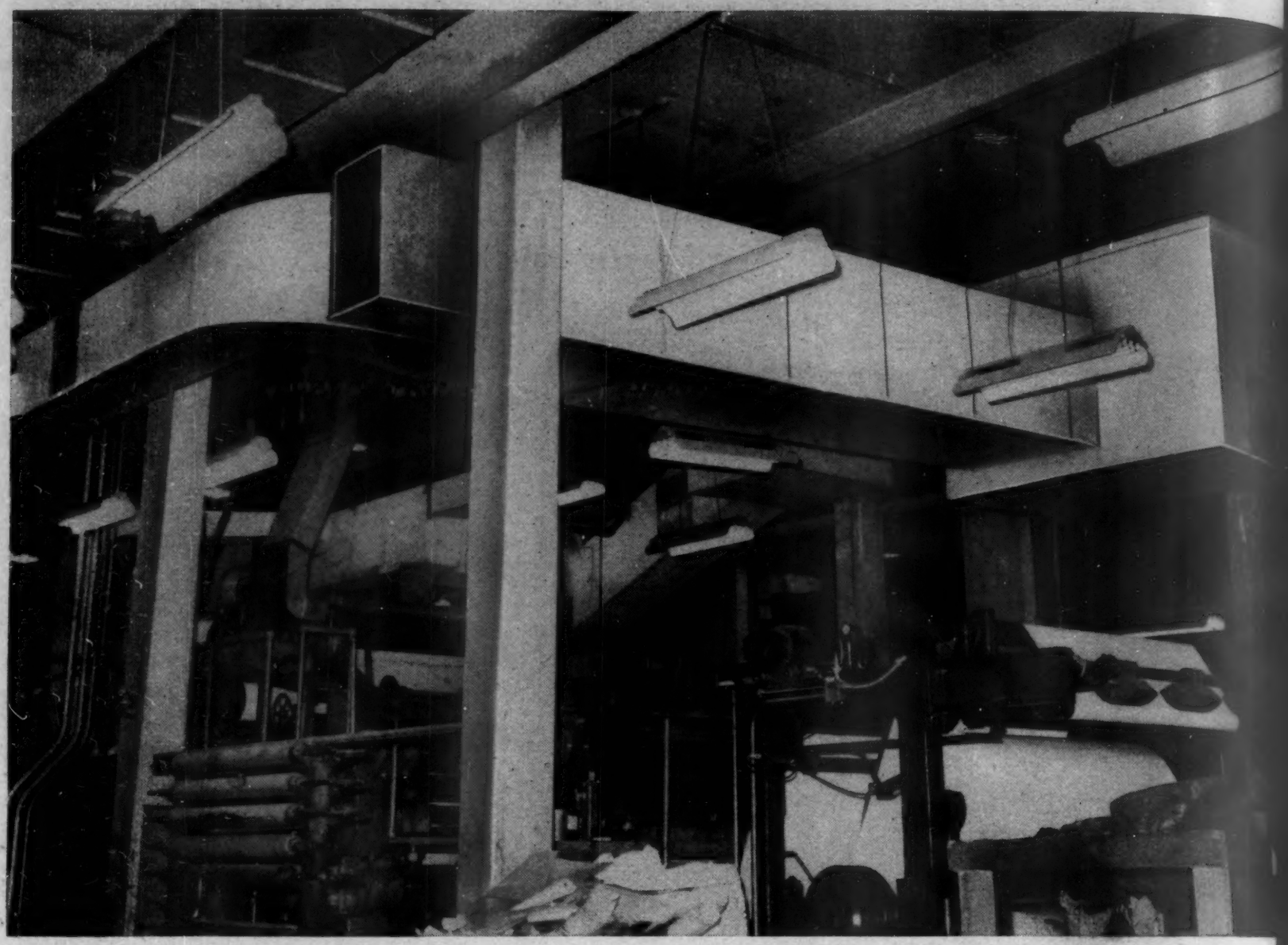
Each of these parts, after bonderizing, is placed on a separate line for enameling, baking, and cooling. Each goes to an entirely different point for storage or subassembly. Yet the assembly schedule is so arranged that these same parts meet on the assembly line.

In order to eliminate confusion during assembly, it was decided that *nothing* should be stored on the assembly floor. But many items are required during assembly, and a lack of parts at any assembly station means shutting down the entire line. That made the problem far from simple. The final solution was to store all purchased parts on the first floor and to deliver them, along with the subassemblies, direct to the production floor at the point of assembly. This is accomplished by vertical lift conveyors. Each of the three assembly lines is provided with six lifts, which deliver, at the various stages of assembly, insulation, food liners, doors, refrigeration units, cabinet accessories, and complete packing cases.

Automatic Switch

At the end of the three lines, an automatic switch has been installed to allow the packed and inspected refrigerator to continue on its way to a shipping and storage building several hundred feet distant. This switch is controlled electronically, and the first completed unit off any one of the three conveyors trips an electric eye. This moves the switch to that conveyor and allows the cabinet to proceed to shipping. Any other cabinets that have reached the switching point in the meantime are held there until the conveyor is clear. Then the electronic device moves the switch to the line where the next cabinet is waiting to go on to shipping or storage.

Since the assembly plant has such a large floor area (approximately half a square mile) it was felt to be impractical to attempt to lay it out on a single board. The floor area was therefore divided into squares approximately 100 feet on each side. These were reduced to a scale of ⅛ inch to a foot. A small board was constructed for each segment and the segments were fitted together in a large vertical frame. As each section of the floor area, comprising several segments, was being developed, the boards making up the section were removed to facilitate the development of that portion of the layout. One definite advantage of this method lay in the fact that when questions developed as to possible structural interference, the board involved was taken directly to the corresponding floor area, and it was a simple matter to settle the question on the spot.



DUCTS remove gas-heated air from the press department. A hazard to health, it is important to get this air out of the room quickly. Insulation keeps temperature up in the ducts, helping to draw the air out of the building through the stack—which also is insulated

INSULATION IMPROVES EQUIPMENT

All high-temperature surfaces are insulated—to improve worker comfort and keep heat where it will do most good

WILLIAM S. WHEELER • FIELD EDITOR, *FACTORY*, CHICAGO

INSULATION of steam drums, gas driers, and air ducts on huge double, five-color presses does an important job of stabilizing operating conditions for the Meredith Publishing Company, Des Moines.

Insulation of the presses has improved working conditions for employes with respect both to comfort and to safety; decreased the plant fire hazard; stabilized pressroom temperature; effected a heat saving; and it permits the highest possible drying speed.

Meredith installed one of the big color presses sometime ago and a second one last July. When operating, paper feeding through the presses travels over a 6-ft. steam-heated drum after the five colors have been printed on one side. The heat dries the ink to prevent smearing. The drum carries steam at 90-lb. pressure and 350 deg. F.

Allowing heat from the drum to escape into the pressroom would upset atmospheric stability and make for uncomfortable working conditions. Therefore, mineral wool insulation was applied to both ends of the drum. The insulation also serves as a major safety factor to protect pressmen from burns while threading or servicing the huge presses.

Enclosed gas-fired driers and fans drive heated air over the top side of the paper as it races between the steam drum and gas drier, in order to speed up the drying of the ink. With heat applied from both sides of the printed paper, the ink dries fast enough to permit maximum production. The paper then passes over a cold water drum in order to set the ink film.

The first gas drier through which the paper passes produces a tem-

ENCLOSED GAS DRIERS and fan drive heated air over the top side of the paper. Mineral wool insulation, applied to both ends of the drum to seal the heat within the hood, improves working conditions and results in higher drying speed

EFFICIENCY AND OPERATOR COMFORT

perature of 600 deg. F. After the five colors have been printed on the opposite side, the paper moves between a second steam drum, which is 5 feet in circumference, and another drier. The second drier operates at 500 deg. F.

To reduce loss of heat, mineral wool insulation was also applied to the metal hoods covering the drying equipment. A pastelike adhesive was applied first, which expedited the application of mineral wool blocks. This shortened the time the press had to be shut down. For the final treatment, the first coat of insulation was reinforced with 1-in. mesh wire and then covered with a finishing cement.

Designed to withstand vibration, this insulation has met the operating conditions encountered at this plant. After more than a year of service, no trouble has been experienced with it.

It has been suggested that this insulation may also lessen danger from static electricity, but no positive evidence, one way or the other, has been obtained.

The ducts that remove the gas-heated air after it has been circulated over the paper, received the same insulation treatment given the steam drums and gas driers. This part of the job was done while the press was running, with a tarpaulin covering the paper reel at the end of the press.

From the standpoint of worker health, it was considered important to get the gas-heated air out of the pressroom quickly through the exhaust ducts. The insulation on the ducts keeps the temperature of this air high, thereby enabling it to pass rapidly out of the building through the insulated stack.

The stack attached to the side of the building is insulated with fireproof material to a height of 55 feet, to increase the draft. Because it is outside, the stack received a special weatherproof insulation. This material was troweled into mesh wire so that wind would not peel it off.

The joints connecting the insulating materials to the base of the stack were flashed to protect them from wind and rain.

CASES IN WORK SIMPLIFICATION

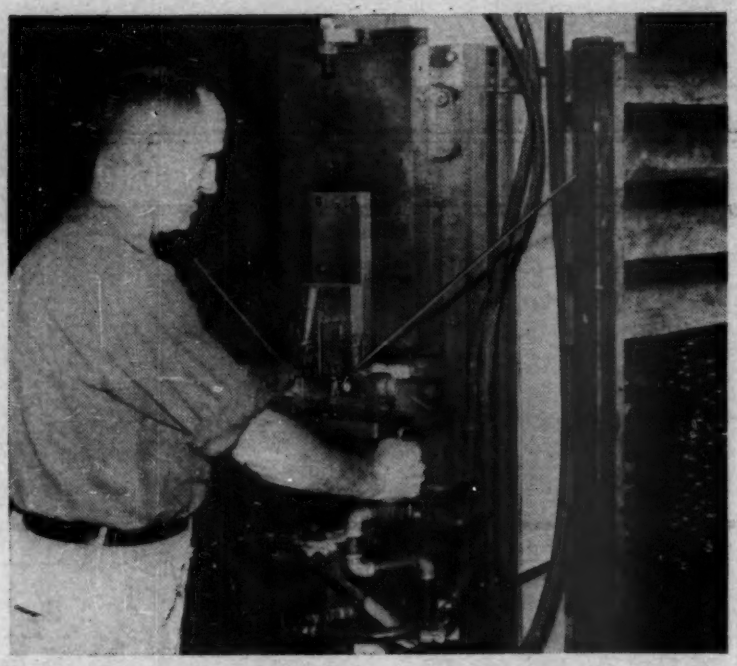
THE Apex plant at Sandusky, Ohio, was laid out in accordance with the best flow and motion economy principles. Hundreds of thousands of dollars went into the purchase of the most efficient, up-to-date equipment.

Management now looks to the methods department for those refinements of individual operations which will make possible attainment of the maximum potential savings.

Organization-wise, Apex is set up to do this job at lowest possible cost. Sandusky is actually four plants, operating within the same physical area. These plants produce, respectively, quarter-horsepower motors, vacuum cleaners, washing machines, enameled parts. Service, purchasing, maintenance, receiving, storing, and shipping facilities are jointly used. This means a reduction in overhead for each "plant."

Better yet, it means that improvements devised by the methods department are available to all four plants, rather than just the one for which they were developed. Under such a system, "double" savings are not unusual, and even "triple" and "quadruple" savings can result.

Here, from the files of H. A. Klingenberger, plant manager, are ten examples of how the program is working out in practice.



HYDRAULIC FIXTURE makes possible production of 3000 metal skids for tank-type vacuum cleaners in each 8-hour shift, with just one operator. The old method was to form these skids by hand, and the work was so strenuous that it was all two men could do to make 640 in an 8-hour shift.

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HANDLING RACK has brought about almost complete elimination of nicks on worm gear drives for washing machine motors. A "standard" item for simplification of handling, these racks have brought unusual savings to Apex. Tiniest nicks on gears (caused by handling after inspection) created trouble in gearcase after assembly. Thus it was too often necessary to disassemble completed gearcases. The racks have cut rejects markedly, and post-inspection difficulties have practically disappeared.

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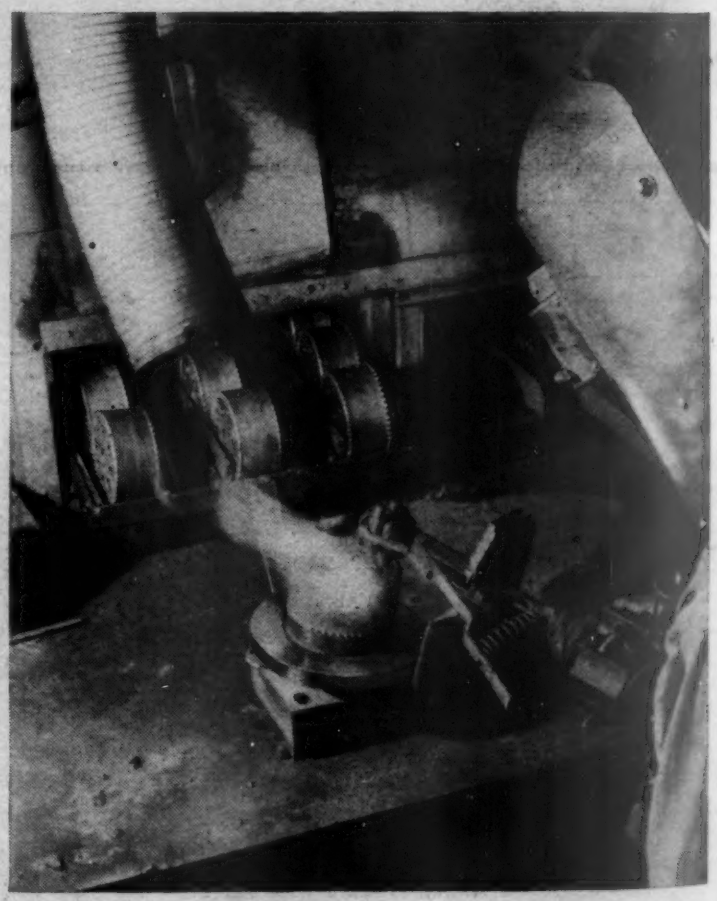

POWER OPERATION of turntable holding copper pin and rotor for welding has increased per-hour output by 42 per cent, and has resulted in superior welds with practically no rejects instead of the former 8 or 9 per cent. Previously, the operator was required to turn his work with one hand while holding the electric arc welder to it with the other. Now the turntable is rotated by a d.c. motor, and the electric arc welder is

8. Apex Electrical Manufacturing Company

held in a special jig for positioning over the work, which eliminates the manual handling. The operator is now free to concentrate on his work, and the fact that the fatigue element has been reduced enables him to do a much better job.

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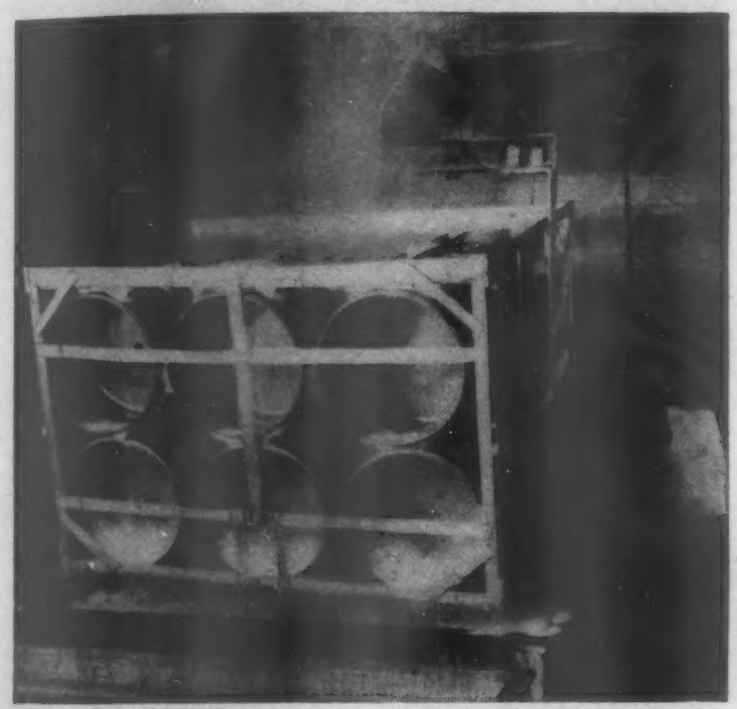

SIMPLE REDESIGN of holding fixture increased capacity of operation by 20 per cent. The bracket for dipping washing machine tubs into the pickling vat had a capacity of 15 tubs. Changes made it possible to load 18 tubs into a new bracket of the same size. No increase in cost resulted (loading time is a negligible part of cycle, hence the same personnel can load the additional tubs), and expensive installation of extra facilities was made unnecessary.

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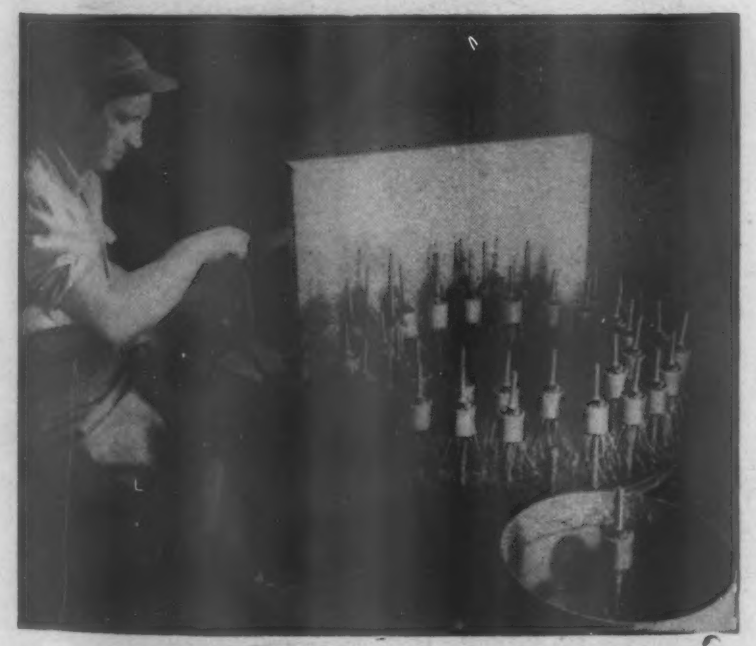

CHANGE IN METHOD of coating and stripping armature lead wires has doubled the output per man-hour for this combined operation. Formerly, a U-shaped scraper was used to remove part of the enamel coating from the copper lead, to provide a good soldering contact with the commutator. Now, the tank at the right contains a power-driven spindle (foot-operated) which dips the lead wires to a pre-determined depth in the stripper compound at the bottom of the tank. The armature is then placed on a rack (center) for the coating to dry and crack. After drying, operator places the armature on a jig (beneath his left hand) with the lead wires down. As he moves the jig away from him, the wires are brought into contact with a revolving brush which removes the coating—without damaging the copper, as the hand scraper sometimes did. To bring successive wires into position for brushing, the operator turns the armature shaft with his free right hand. Better quality of work and greatly increased output are the results.

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DIVISION OF LABOR has doubled output per man-hour on the assembly of handles for upright vacuum cleaners. Formerly, at a single bench, each man performed nine separate operations: Insert insulation; insert handle cord; install switch; insert extension cord; attach bag spring assembly; connect switch leads; fasten switch plate to handle; attach handle fork assembly; and wind cord on clips. Now, a series of mechanical holding fixtures has been installed on a long bench. Work cycles (shown, installing switch assembly) have been balanced to permit operation on an assembly line basis.

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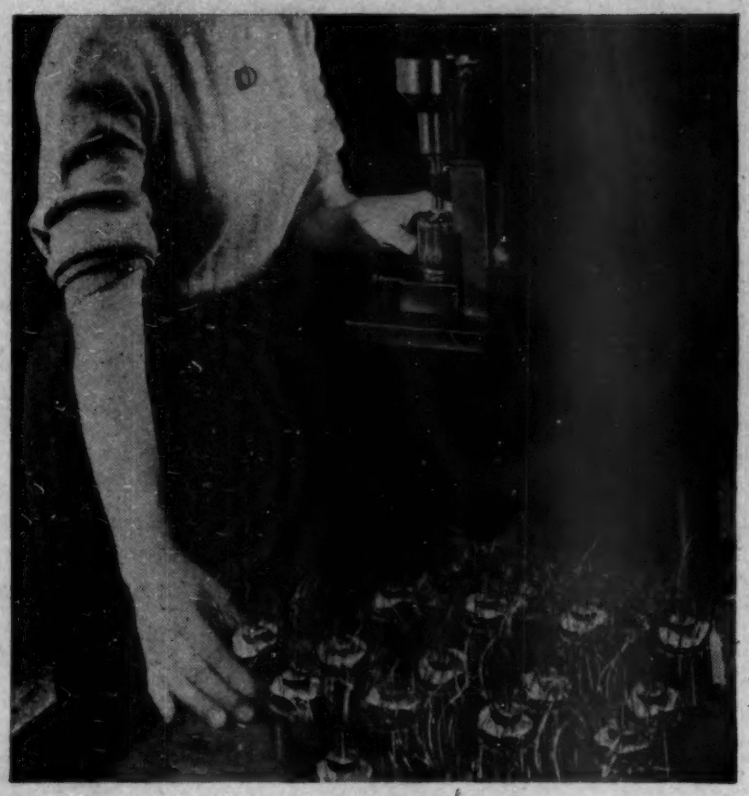


MECHANIZATION of the operation permits one woman—without fatigue—to press commutators on armature shafts. The old method, utilizing hand presses, was arduous work for two men. The commutator is placed in the insert in the bottom die of the press. Armature shaft is placed over commutator and the air press makes a controlled fit in a fraction of the time that was formerly required.

AIR JIG on which a dummy rotor (growler) is mounted, installed beneath a table, has increased the efficiency of the test operation by 30 per cent. Stators slide between guides. As a stator comes into position over the test point, the growler is forced up into the stator. A small rotation growler spins in the direction of the field as it is moved up through the field. Manual operations have been eliminated.

POSITIONING FIXTURE has resulted in a three-to-one saving in labor for assembling upright vacuum cleaner bag and bottom coupling. When this operation was performed on a wood form, much time was lost in locating the exact spot at which the coupling had to be attached to the bag. The special fixture (foreground in picture) has a locating arm which, when pressed down, lines up the center point of the bag with the proper position on the coupling. A somewhat similar arrangement (near left of photograph), together with supplying pre-cut wire, has resulted in a two-to-one saving in labor for attaching couplings to small bags for the hand cleaner.

CHANGE OF SEQUENCE of paint drying operations permits 20 per cent increase in daily output, and (together with installation of a conveyor) has reduced rejects by 75 per cent. Two drying furnaces were formerly used, first for drying "ground" coat, then for drying "finish" coat. Material awaiting either operation was piled on floor near furnaces. Now one furnace runs continuously on ground coat, the other on the finished coat. Damage caused by handling is eliminated because parts remain on conveyor between operations. Now it takes only 20 hours to process quantity that previously required 24. Floor space and handling labor are additional important savings.

POWER: WHEN TO MAKE, WHEN TO BUY

DAVID MOFFAT MYERS • MYERS, FULLER, & ADDINGTON NEW YORK

If you do not buy your power supply then you must generate it. The latter alternative means additional capital expenditure. Therefore, unless you can secure a handsome return on such an investment, you would prefer to buy your power supply, and so should I. Furthermore, you would eliminate another job for the management. Of the total supply of energy to United States industries, 67.4 per cent was purchased in 1946.

Usually a manufacturer can turn capital over faster by modernizing his production equipment than by investing in a power plant. Even so, power generation may be made to show a good return where conditions are favorable.

For example, a paper mill cannot afford to pay public service rates for electric power when it is able to generate practically all its power as a direct byproduct of its process steam. A cost of 2 to 4 mills per kilowatt-hour is quite in line for a properly engineered paper mill generating station.

That is the case also in a number of other industries where the ratio of steam per hour to kilowatts is high. Such ratios may obtain in the manufacture of certain chemicals, rayons, plastics, and rubber, as well as bleaching and dyeing.

There are possibilities here and there where the electric load can be divided between the private plant and the utility with advantage to both. Parallel operation of the two sources of energy permits the purchaser to generate a quota of very cheap power from his process steam with a single high-pressure boiler and turbine, while the power company supplies the balance of energy and provides necessary standby.

Although each power problem must, of course, be determined on its individual merits, nevertheless certain general rules can be given.

It Pays to Make Power . . .

. . . When all the exhaust steam from the power units can be utilized for heating or process work, unless, in the small plants, labor costs are prohibitive. Exhaust steam can now be delivered at high pressures (100 to 300 pounds and higher) from power units served by high-pressure boilers. Hence, the number of manufacturing plants that can profit by generating their own power has largely increased. Even a little factory with a 100-kw. engine-generator set, using all its exhaust steam, may generate a kilowatt-hour for ½ pound of coal above the quantity that would be used for heating alone, with the engine shut down. This ½ pound compares with the 1.31 pound per kilowatt-hour needed by average central stations.

. . . When the steam heating, or the process load that could be supplied by exhaust steam, is relatively large in comparison to the power load. Where the heating load is fluctuating or seasonal, but of sufficient amount, high efficiency can be maintained by combining condensing and non-condensing power units to balance the requirements at all times. Or such a steam balance may be very simply secured by use of the extraction type of turbine-generator. Economy can often be promoted by operating steam-driven compressors, fans, and pumps during the heating season, when their exhaust can be used, and using purchased power, with electric drive for such units, at other seasons.

. . . When there is a moderate-to-large continuous power demand for 24 hours a day, even when there is no heating load or use for exhaust steam. Under these conditions the overhead charge per kilowatt-hour is small, and a power plant of simple but efficient design can be operated very economically.

. . . When a considerable boiler plant must, in any event, be maintained for heating or process work. It may then be possible to install an economical power unit without adding boiler capacity, so that there is no added overhead charge except for the power unit itself.

It Pays to Buy Power . . .

. . . When there is little or no need for steam for manufacturing processes or for heating buildings in plants of small or moderate power demand—if the rates are right.

. . Even when power can be made more cheaply than purchased power can be bought, if certain special circumstances can be met. For example, if to make power would require a considerable capital investment, the limited capital available could be turned over much more rapidly by improving the production end of the business.

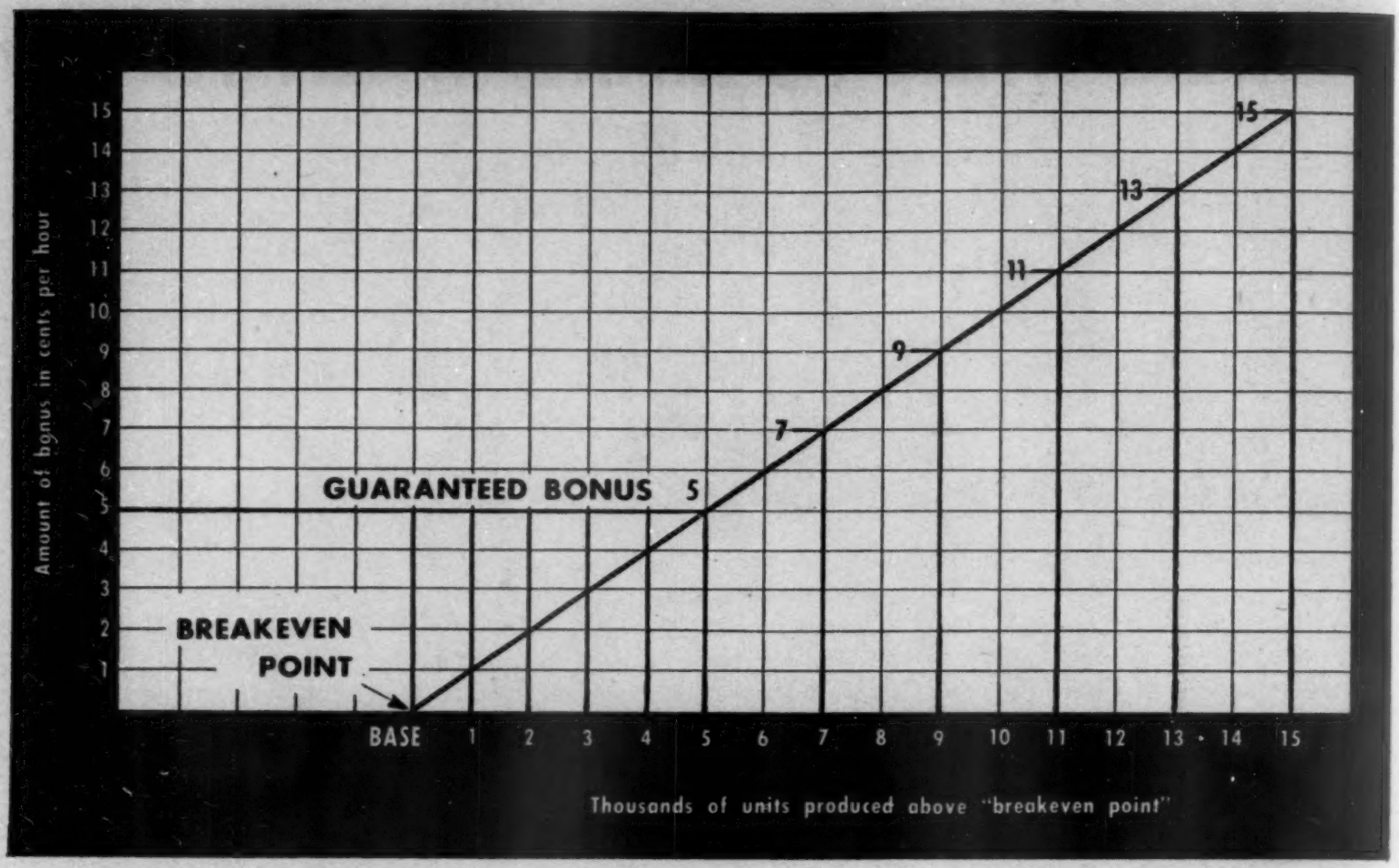
. . . When a highly developed superpower system makes the cost of purchased power almost as low as that at which it could be generated.

. . . When the owner's business policies are unsettled, or when his business may be growing so rapidly that he does not desire to risk building a power plant that in a short time might be unsuited to his needs. Such conditions might change not only the size of steam generating and power units required, but also the type of equipment.

It Pays to Buy and Make Power . . .

. . . When all the exhaust steam from existing power units can be used for heating and process work, but when the byproduct power so generated is insufficient to meet requirements.

. . . When the exhaust steam can be used in the heating months only, and would be wasted in the non-heating months. Purchase of power at suitable rates in the warm months may result in better economy than operating non-condensing engines and turbines or diesel units.



VOLUME ABOVE BREAKEVEN POINT is basis of the "plus business" bonus at Micro Switch. Employees know that reductions in cost mean a lower breakeven point, hence more opportunity for them to earn more bonus at given level of production

"PLUS BUSINESS" BONUS PAYS OFF

Profits come only from production above company's breakeven point. Bonus is based on amount of that "plus" output

M. W. EATON • SECRETARY-TREASURER, MICRO SWITCH DIVISION, FIRST INDUSTRIAL CORPORATION, FREEPORT, ILL.

EVERYONE shares and shares alike in the "plus business" bonus plan at Micro Switch. The only exceptions are executives under contract. Branch sales office employees, but not salesmen, are included in the plan.

Basic purpose of the plan is to reward employees for sales and production over and above the company's breakeven point of doing business. Management felt that this would be a prime factor in creating an incentive for the employee to produce the added units that were critically needed by industry.

The plan also incites employees to think how jobs in the factory and functions in the office can be improved to increase production, lower cost, improve quality, and make work easier. Both direct and indirect employees do this without any reserve whatsoever because they know that lower costs mean a lower breakeven point, hence more opportunity for a higher bonus. In other words, everyone benefits through improvements—the employee, the company as a whole, and the customer.

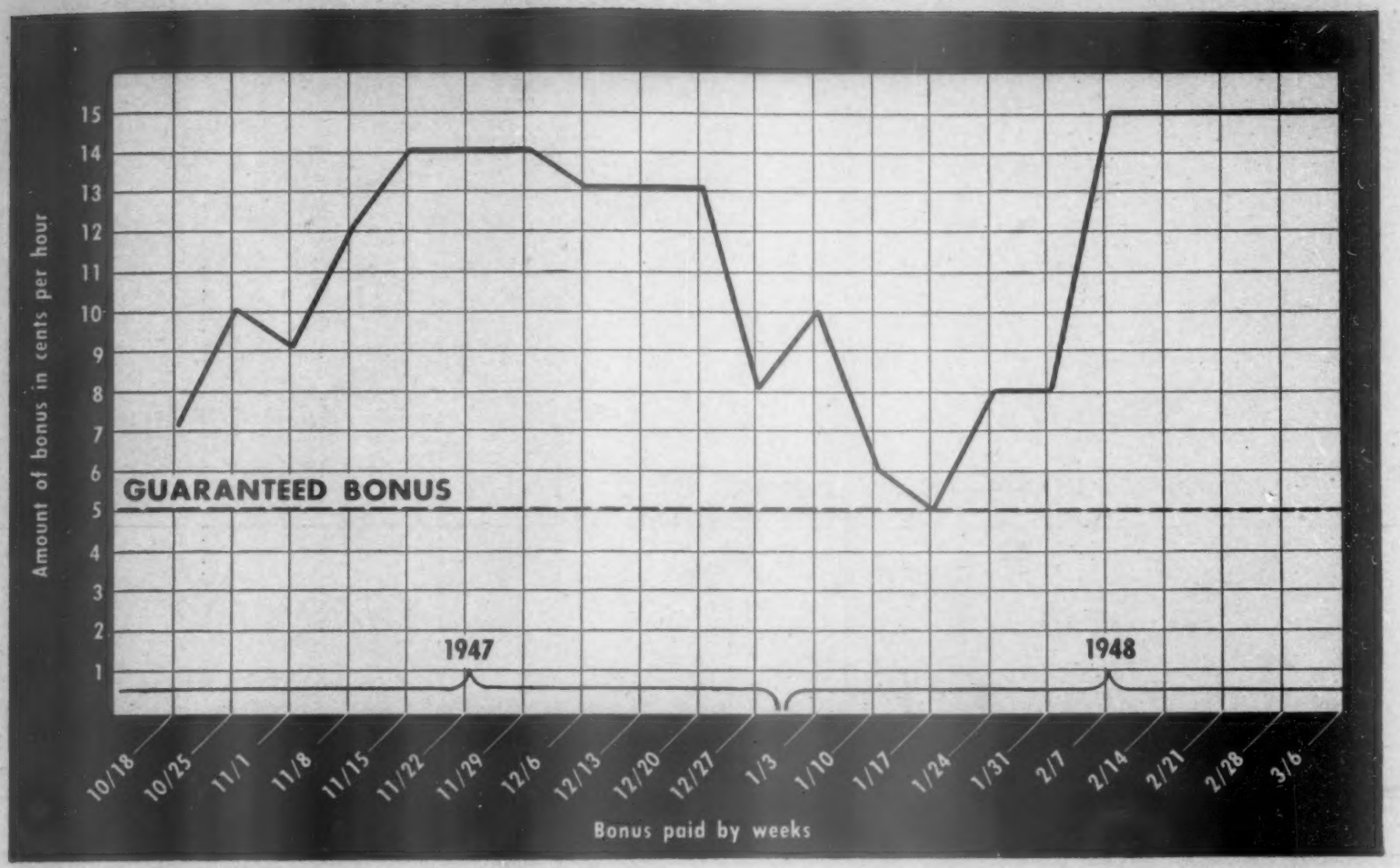
How the Plan Works

Employees, management thought, should share in the benefits realized from increased production and sales. The company's breakeven point of doing business, where all primary expenses were paid, was determined. On all production beyond this point, the company has a chance to make a profit. It is in this portion that management felt employees should share, and share alike. The incentive to the factory workers is to do a better job and to produce more. To the office worker it is to expedite orders and other paperwork through the organization in the most efficient way and with the minimum of red tape.

Bonus steps were established in thousands of units shipped over and above the breakeven point. The company was so confident that the plan would work that a 5-cent hourly bonus guarantee was incorporated in the plan. This is the equivalent of five bonus steps, a one-cent premium being paid for each step.

Thus far, bonuses of from five cents to fifteen cents per hour have been paid. Ten cents or more per hour bonus has been paid more than half the time.

Fifteen cents per hour is the



PERFORMANCE UNDER BONUS PLAN has been good. Only once has production fallen to point below level of guaranteed payment. In latest four weeks shown, maximum bonus of 15 cents per hour was paid. This represents "theoretical capacity" of the plant

FOR GREATER PRODUCTIVITY

maximum bonus at the present time. This unit group has been figured as the "theoretical plant capacity." "However," employees have been told, "we shall, naturally, let the bonus go as high as production can go if someone can figure out how we can increase capacity and hold the breakeven point." Recently, the maximum bonus was paid in each of four consecutive weeks.

The actual computation is made from a moving average. Bonus for each week is based on the amount shipped for that week, plus the shipments of the three previous weeks. This reduces the wide variations likely to occur if each week were calculated separately.

Bonus Figures Are Posted

"Plus business" bonus figures are posted on the bulletin boards each week. All calculations are shown. This is done in advance of check deliveries to employees.

When the plan was ready for introduction last October, the entire supervisory force was called together. A thorough explanation was made by top management to this group. They were told that it was their responsibility to explain the plan to each of their subordinates. This was to be done, the supervisors were told, within an hour after the meeting. The purpose was to dispel any rumors that might otherwise run rampant through the organization.

Management at Micro Switch feels that its policy of always working through the supervisory group is a sound and basic philosophy from which to operate. These people are management's representatives in the plant, hence they should have the privilege of announcing good tidings, as well as the responsibility for bad news. Management believes that this policy helps bind employees and the supervisory group into a team.

Production was practically stopped during the period of explanation. Supervisors used a procedure prepared by the company to explain the "plus business" plan. They were told to read this and to discuss it in detail. They were to try and answer any questions, but not to stick their necks out. Any questions they could not answer they were to bring back. Employees were promised an answer to any such questions the same day.

Rewards Must Be Earned

Employees were told that the rewards under the plan were not gifts. Rather, they must work and earn their share. New employees receive a full explanation of the plan in the personnel department before starting work.

The plan is paying dividends to everyone—the employees, management, and company. Productivity is high, and going higher all the time. And production costs are going down.

ROTATING ASSEMBLY TABLE receives trays of sorted fins (arrow *A*) and baffle cups (arrow *B*). These are assembled at four arbor press work stations, leave table to join main line via conveyor (arrow C). Sorting bins and table save 4000 man-hours a year

MADE A NEW LAYOUT TO GET

Here is dramatic subdivision of work coupled with component lines which feed direct to point-of-assembly

ARTHUR R. COLLINS • WORKS MANAGER, SOUTH WIND DIVISION, STEWART-WARNER CORPORATION, INDIANAPOLIS

A STREAMLINED layout, with a double-barreled main assembly line, is paying big dividends at Stewart-Warner's South Wind heater plant.

Production has increased more than two and a half times. Assembly labor costs are down 15 per cent, and are expected to go lower. Materials handling costs have been reduced substantially. Work has been made easier for employees.

All types of conveyors are used: Rollers; steel slide rails; wooden slides; two-sided roller rails; and overhead, power-driven monorails. Each type is used where it will best fit the handling problem involved. The conveyors are interwoven to form an integrated, smooth-flowing, progressive assembly system.

Every available source of management and worker know-how was tapped to find the best way to improve the assembly operations. Suggestions were received from workers, production supervisors, and others. Plant engineering, plant layout, and methods analyzed carefully every idea submitted.

Work is subdivided to minimize the number of manual and mental operations required of each worker. The result is that each employee need be skilled in only one division or component of the heater assembly to deliver top performance.

Operations Studied

Detailed observations of all operations were made by time study. Each operation was broken down into its elements. This made possible a balancing of the work load at each station. As schedules change either up or down, it is possible to rebalance the work loads quickly to any volume of production by simply varying the number of workers.

MAIN ASSEMBLY LINE is fed from subassemblies at point-of-use. Subdivision of labor applied throughout. Worker *A* tightens terminals, *B* makes visual inspection, *C* checks motor speed with stroboscope. Rejects sent to "hospital" via slide rail (arrow)

ASSEMBLY SAVINGS

The heater is produced on nine assembly lines. Eight of them are component lines to feed the main assembly. The heater main line is known as the "double-barreled line" by both management and workers. It is two-sided, with like operations being performed on both sides. This arrangement offers the utmost in flexibility.

The assembly system is closely interwoven to provide almost perfect continuity from one end to the other. Component lines feed into the main line close to the point of assembly of the particular part to the heater. This minimizes the amount of handling required. Once the components reach the final line, there is no stopping until the heater is finished and packed for shipment.

One overhead, power-driven conveyor carries the heater from assembly to the test stands. Another allows heaters to cool while they travel from the test stands to final inspection and packing.

Special racks on the cooling conveyor carry six heaters each. Rejected heaters are hung on the bottom hook of the rack, which is painted red for easy identification. The rejects are then fed to a "hospital" section for repair.

Traveling Stockrooms

Both of these conveyors serve as traveling stockrooms. Heaters can be taken off the first time they pass the transfer point, or they can be left on the racks to be removed when needed. This arrangement provides a bank of material which has virtually eliminated production delays. At the same time, the size of the bank is held within economic limits because, obviously, it is not possible to exceed the fixed capacity of the conveyor.

This improved assembly system is paying handsome dividends to all concerned—employees, customers, and company. Materials costs are up 50 per cent. Hourly wages have more than doubled. Yet it has been possible to hold the necessary increase in price to 30 per cent.

To illustrate the features of the installation which helped make this possible, FACTORY'S field editor toured the plant with company executives, selected the photographs on these and the following pages.

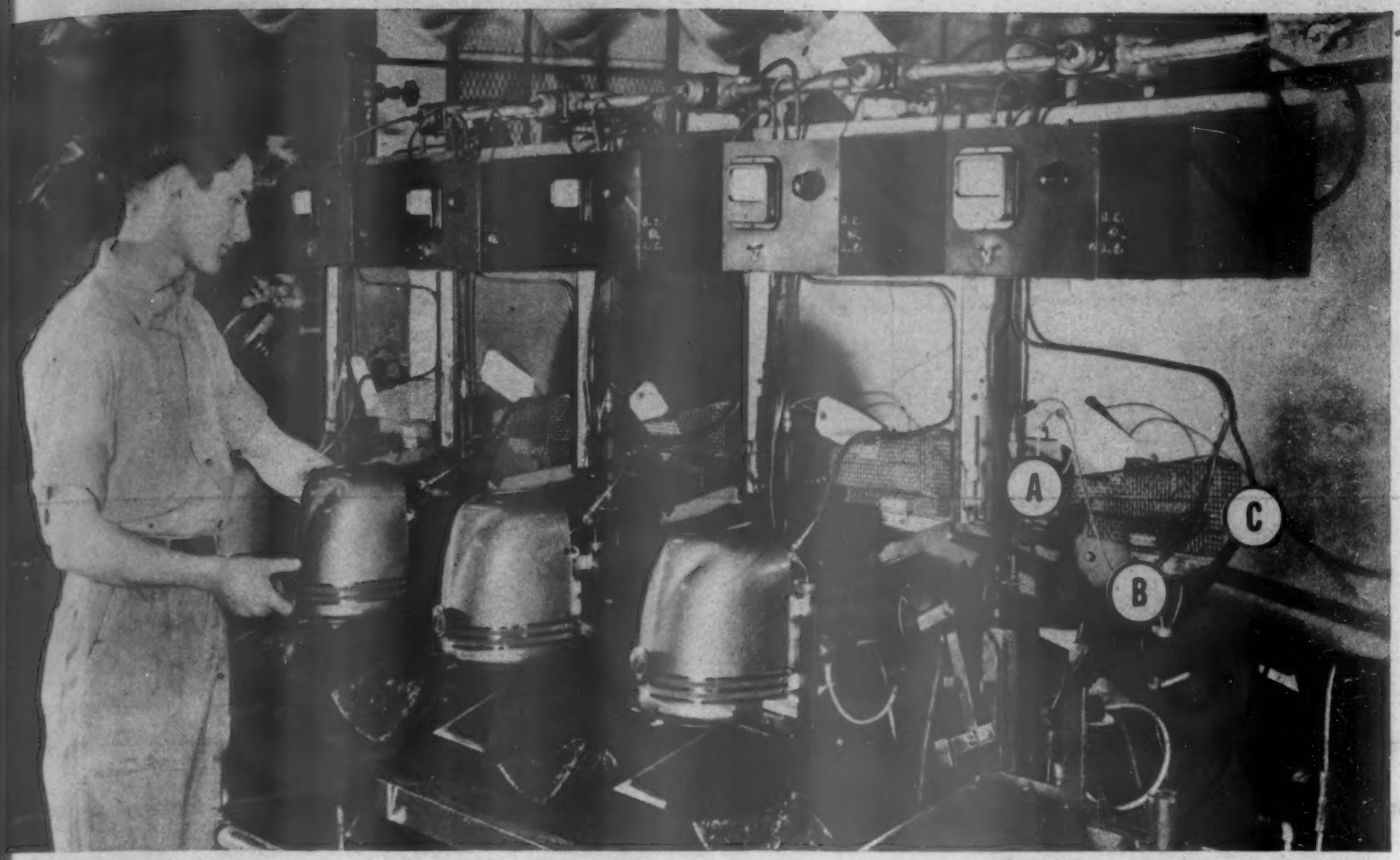
CONTINUED ON NEXT PAGE

TIP-UP RACKS operated by electric hoist eliminate manual lifting formerly involved in supplying sorters with fins. Boxes are placed on roller conveyor by lift truck, slide right into rack

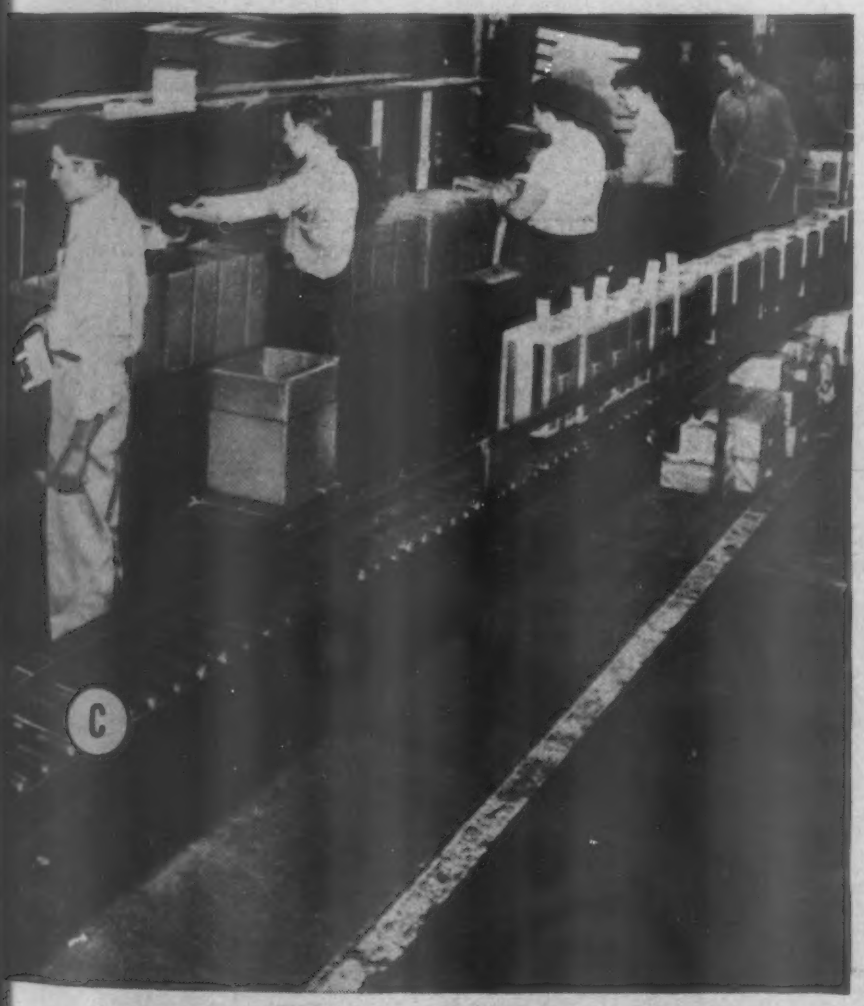
DUPLICATE OPERATIONS take place simultaneously on both sides of assembly line. Arrangement permits "T" supports (arrow) for pairs of convenient, fatigue-reducing air tools

FINAL INSPECTION takes place as heaters are removed from overhead conveyor. Underwriters label is attached and unit is placed on slide roller conveyor for transport to packing

IN PACKING DEPARTMENT, heaters enter at *A* via slide conveyor from final inspection. Box components are removed from racks, and as assembly progresses the boxes move along the bench

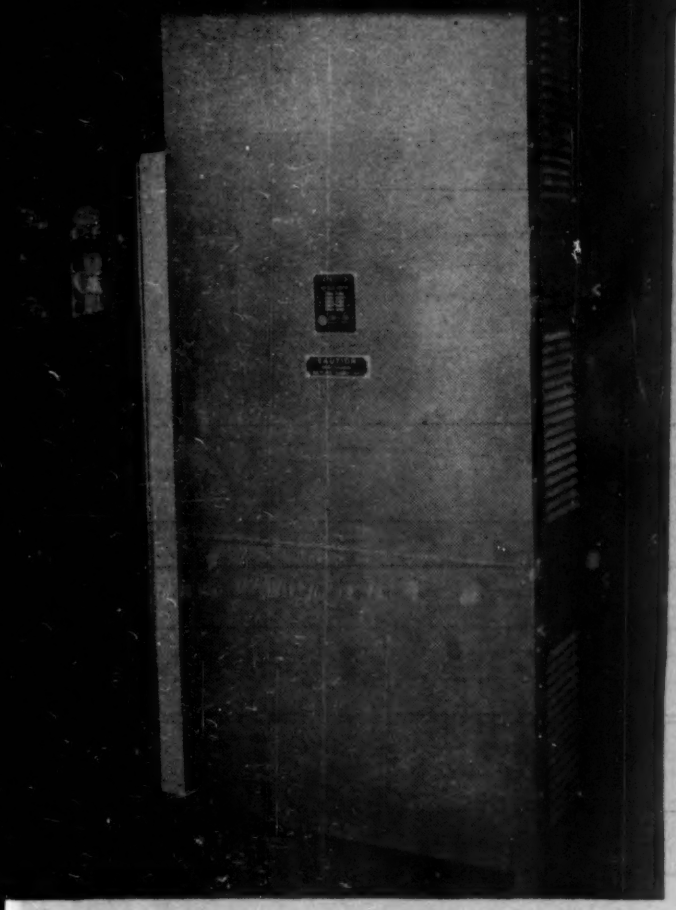


MULTIPLE-TEST stands permit operational testing of five heaters at a time on each side. Quick-acting connections (arrows—*A*, electrical; *B*, vacuum; *C*, fuel) enable operator to load and unload heaters in minimum time. Fumes created during test are exhausted through duct below each station. Conveyor in rear serves as cooler and traveling stockroom for heaters after test is completed

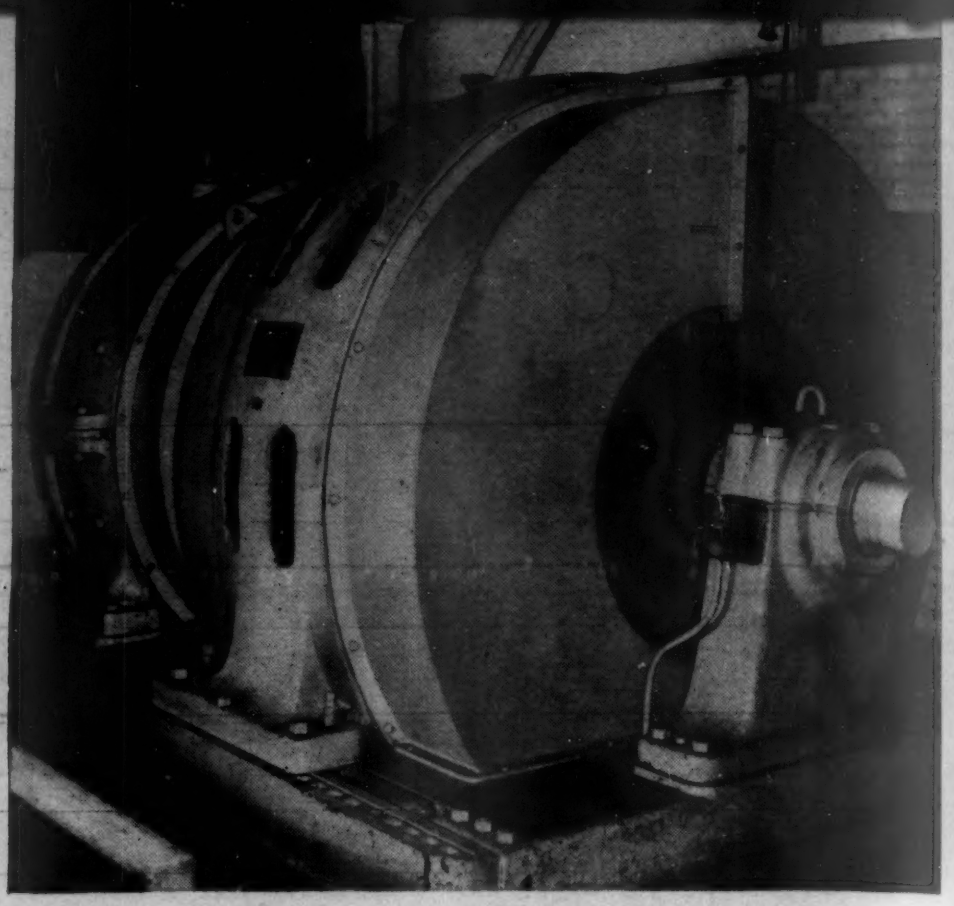


to the point where the units are inserted (*B*). After carton is sealed it is transferred to the gravity roller conveyor (*C*), along which it moves to the storage section of the shipping department

LIGHT STEEL STRAPS are used to hold groups of six cartoned heaters together as a unit. As result, handling is simplified and packages no longer have a tendency to fall off the dollies



AN INSTALLATION OF 3545-KVA. CAPACITORS . . .



PLUS POWER-FACTOR-CUTTING 2140-HP. SYNCHRONOUS MOTORS . . .

SAVED MONEY BY RAISING

Raising power factor to about 99 per cent made savings in power bills that paid for the capacitors in four years

W. WEATHERS SALE • ELECTRICAL ENGINEER, REYNOLDS METALS COMPANY PLANT NO. 1, LOUISVILLE

An expenditure of approximately $20,000 for capacitors, including installation, has brought Reynolds a return of about $26,150 during the past three years. In addition to the large dollars-and-cents savings, several important operating advantages came about automatically as the result of correcting the power factor.

Steps to improve power factor were first taken early in 1944, when six banks of capacitors, ranging from 60 to 720 kva., were installed.

The electrical engineers in the plant knew that the power factor was low and that it was increasing the power bills. At the same time it was drastically curtailing the efficiency of all the electrical equipment. The power lines were overloaded. Motors throughout the plant were constantly overheating.

To complicate matters further, Reynolds was planning a large expansion of the plant, which would call for equipment using still greater amounts of electrical energy. The utility company insisted, however, that electrical power was not being used to the best advantage. Also that government regulations then in effect would not permit either Reynolds or the utility to purchase additional equipment until the power factor, which for months had been hovering around 70 per cent, was improved.

The contract with the utility company carries a power factor clause, which rewards customers who maintain a power factor higher than 80 per cent. A power factor of 100 per cent would net a saving of 4 per cent on the power bill.

On the other hand, this clause penalizes a customer severely if the power factor falls under 80 per cent, by increasing the power bill.

After a careful analysis of conditions, the engineers drew up plans for an installation of capacitors that would, assuming no increase in power consumption, raise the plant's power factor to approximately 95 per cent. It was estimated that at this power factor 1300 kilowatts more power would be made available immediately from the present power lines and equipment. This increase would be enough to care for the immediate expansion. It was realized that increasing the plant load would probably lower the power factor slightly.

Immediately after the installation of the first few capacitors, a noticeable increase in the plant's power factor took place. Each month's report indicated that it was climbing upward. In January, 1944, with only a few capacitors in operation, a power factor of 76 per cent set a new high figure for this plant. With a few more in operation in February it climbed to 82.4 per cent, and after a lag in March, which saw a drop to 81.7 per cent, April set an entirely new and unheard-of figure of 91 per cent. Finally, in September, the power factor rose to 98 per cent. Since then, it has remained close to

DROPPED THE PLANT POWER FACTOR ENOUGH TO RELEASE 1300 KW. FOR NEW EQUIPMENT CONTROLLED THROUGH PANELS ABOVE

POWER FACTOR

99 per cent, averaging 99.3 per cent throughout 1947.

The total rating of the capacitor banks now in service is 3545 kva. Banks are switched on and off the line manually as electrical loads vary.

The improved power factor was at once reflected, of course, in a number of distinct advantages. It became possible to add the additional equipment that was needed, and supply it from the existing lines. All electrical equipment operated more efficiently. Line voltage throughout the plant was greatly improved, became uniform and constantly up to its proper value. In addition, the utility company was put in position to increase the amount of electrical energy that it could supply to the plant.

While attention was being devoted to the installation of capacitors, much thought also was given to the motors that were being installed throughout the plant. As new motors were needed, the engineering department considered carefully the type and size of motor required for each application. Therefore, such equipment was properly fitted for the service expected of it.

Many synchronous motors were included in the new set-up, since this type of motor helps to maintain high power factor.

Power Bill Discounts

All the while the improved plant power factor was making substantial savings for Reynolds in the form of discounts from the power bill. In April, 1944, when the power factor reached 91 per cent, a discount of $416.66 had appeared in the power bill. This was quite a contrast from a few months previously when the power bill included the usual penalties, which sometimes ran as high as $650 per month, for low power factor.

That discount of $416.66 was merely the first of many others. From April 1 to December 31, 1944, total discounts amounted to $5727.02. November was the top month, with a discount of $752.32. In 1945, the discounts totaled $6782.87; in 1946, they amounted to $5956.08; and in 1947, they reached $7677.76, for a total of $26,143.73.

When the total of these discounts is matched against the cost of installing the capacitors, approximately $20,000, it will be seen that in addition to paying for themselves, the capacitors have already turned a neat profit back to the company. They are still comparatively new and will continue to earn discounts each month for a long time. Hence they will pay for themselves over and over again. All this return in cash is in addition, of course, to the other advantages that they have provided.

While the savings made through discounts in the power bills are ample evidence of the value of the capacitors, they are really somewhat short of the true story. Instead of earning discounts for high power factor, Reynolds had actually been paying penalties for low power factor. It is reasonable to assume that, without the corrective effect of the capacitors, the monthly penalties, although uncertain in amount, would still be imposed. The savings due to the capacitors should, therefore, not be considered to be only the actual discounts from the monthly power bill; the former penalties should also be added.

In an exclusive statement to FACTORY'S readers, the head of the "Watchdog" Committee on Labor-Management Relations reports experience during

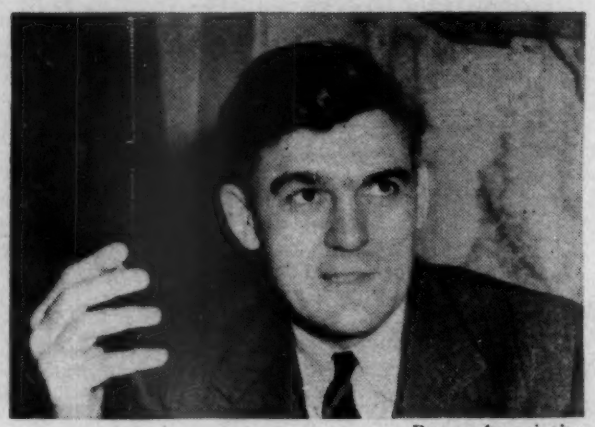
A YEAR OF THE NEW LABOR LAW

JOSEPH H. BALL

U. S. SENATOR FROM MINNESOTA

THE Labor-Management Relations Act of 1947, commonly referred to as the Taft-Hartley Act, has now been on the books for approximately one year. As Chairman of the Joint Committee on Labor-Management Relations, the so-called "Watchdog Committee" created by the Act, I have followed closely the operation of the new law. The interpretations placed upon its various provisions by the National Labor Relations Board and the courts, the character of its enforcement by the departments and agencies interested with its administration, and its effectiveness in stopping those abuses of power which Congress was determined to stop, all have had our closest scrutiny.

While the Act is working out very well, there are a number of indications that further legislation is going to be necessary. So far no serious problem in labor relations has arisen for which the new law does not provide an adequate remedy, but labor relations have a fluid quality which makes it impossible to anticipate today what may be a major problem tomorrow.



Press Association

Joseph Hurst Ball was appointed to the U. S. Senate (to fill a vacancy) on October 14, 1940. He was reelected to a full term in 1942. During the entire period of his service he has been a member of the Committee on Labor.

Previous to his Senate career, Ball was a free-lance writer and newspaper man covering political assignments. In 1944 he broke with his party to support President Roosevelt for a fourth term.

A year later, he co-sponsored the Ball-Burton-Hatch Bill, first post-war attempt to recast the government's labor policy. A strong supporter of the Taft-Hartley Act, he now heads the committee that will recommend changes in the law.

The very creation of the Joint Committee and the particular subjects to which its study was directed clearly demonstrated that Congress anticipated further legislative needs and believed industry-wide bargaining, compulsory union membership, the kind and character of administration of labor laws, and union welfare funds were the fields of danger. Developments during the first year after passage of the Act have proved that Congress made a fairly accurate estimate.

I suppose the reaction of many employers, confronted with labor problems for which the Act provided no remedy, has been that the law is a far cry from what it was loudly proclaimed to be. It should now be quite apparent to all that the appellation "slave labor" law with which organized labor tagged it was a complete misnomer. Let us examine a few of the abuses which the Act has operated to diminish.

Strikes in support of secondary boycotts and jurisdictional strikes have almost disappeared from the news. The injunction remedy which was given to the National Labor Relations Board plus the right of the injured party to sue for damages have combined to provide a fairly complete deterrent. It did not need many of such actions to demonstrate that in this field the Act had the necessary teeth. The Board has asked for injunctions in only 16 instances and there have been only 12 damage actions reported involving secondary boycotts or jurisdictional disputes.

The dire prediction that the exclusion of supervisory employees from the benefits of the Act would provoke widespread strikes by such employees has utterly failed to materialize. We have learned of only one such strike since passage of the Act.

The so-called "free speech" amendment, which permits an employer to speak out on issues just as freely as union organizers, was not written just to permit an employer to blow off a little steam now and then. Too often unions had attempted to build closer allegiance to the union by campaigns of hate, fear, and suspicion of the employer. Such attempts created bad labor relations and bad public relations. We believed it necessary, because of some farfetched rulings of the NLRB, to assure the employer that he could, without liability, tell his side of the story. It is little wonder that some workers followed Communist leadership when it was considered an unfair labor practice for their employers to call a Communist a Communist.

Employers are using this new right with caution, mindful of the restriction that their words must not contain a threat or a promise of benefit.

The provision permitting an employer to petition for an election when confronted with bargaining demands, or when he has good cause to believe that the certified bargaining agent no longer is the majority choice of his employees, is also being used, but not in the fashion predicted by opponents. Less than 4 per cent of the elections conducted during the first year were initiated by employer petitions.

The predictions that employers would swamp the Board with unfair labor practice charges against unions, and wreck union treasuries with a multiplicity of lawsuits, have proved to be equally unfounded. A total of 2,384 unfair labor practice charges have been filed with the Board under the new law. A breakdown shows 907 to have been filed by unions, 1,188 by individuals, and only 289 by employers. The Joint Committee has attempted to maintain a file on the cases instituted in the federal courts pursuant to the provisions making unions suable on their contracts and liable for damages occasioned by secondary boycotts and jurisdictional strikes. The score, as far as we can ascertain, is suits for contract violations, 21; damage suits for jurisdictional strikes and boycotts, 12.

The amendment requiring unions to bargain in good faith is proving to be one of the outstanding corrections made by the Taft-Hartley Act. We were told that it was completely unnecessary, since unions for their very existence must bargain collectively. Too often, however, some strong union's approach to bargaining was a curt "sign here or nothing moves in or out." Unions having a complete monopoly of the labor supply utterly failed to meet any of the requirements that the Wagner Act provided for employers. The International Typographical Union's program was one of amending its constitution and bylaws and insisting that, after expirations of present contracts, members conduct themselves in accordance with the new rules. Such practices, if generally adopted, would destroy collective bargaining.

Perhaps the most salutary effect of the Act is the assumption by unions generally of more responsibility for the conduct of their members and agents. It results from various specific provisions of the law such as the suability clause, but perhaps more from the very fact that the Taft-Hartley law demonstrated that it was possible to pass a law in the United States which was universally opposed by union leadership.

A somewhat unexpected development arising out of the provision making unions suable for breach of contract, was the many contracts wherein the unions guaranteed effective affirmative action to prevent and stop "wildcat" strikes in exchange for a clause exempting them from liability.

The provision requiring union officers to swear that they are not members of the Communist Party before their unions may have access to the processes of the NLRB was designed to drive the Communists from their positions of leadership in some unions. To the American public, which has recently seen one country after another taken over by the Communists, with control of unions their most effective weapon, the provision is a popular one.

Strikes imperiling the national health and safety were threatened in atomic energy and occurred in coal. In both instances an injunction was obtained under the national emergencies section of the new law.

If additional or corrective legislation becomes necessary, I believe it will be for one or more of the following reasons:

1. Inability of the NLRB to dispose promptly of its large case load.

2. Because employers have acceded to union demands to violate it.

3. Because loopholes either in the statute itself or in its administration permit the non-Communist provision to be bypassed.

4. Inadequacy of the restrictions on compulsory union membership and welfare funds.

5. Because Congress failed to provide a permanent solution to industry-wide bargaining and strikes.

1. Delay at NLRB

The most frequent complaint made to the Joint Committee is that it takes too long to obtain a decision from the NLRB. This complaint is made as often by employers as by unions. We heard it back in the days of the Wagner Act, and now that the Board is receiving some 4500 new cases each month, the prospect is for longer delays unless the Board is able to speed up its procedures. Delay in labor case handling tends to encourage use of self-help, which may take the form of strikes.

If the Board finds it impossible to dispose of its cases promptly, Congress must explore other means for their determination. One suggestion that merits careful consideration is for the Board's General Counsel to present all unfair labor practice cases directly to a court and confine the Board's jurisdiction to representation matters.

2. Joint Violations of the Law

The threat of a strike has been sufficient in some cases to obtain employer agreement on a clause whereby such employer restricts his rights in the hiring of new personnel. The same inducement has produced contract clauses permitting a check-off of union initiation fees and assessments as well as the dues check-off which is permitted by the law.

Perhaps no amendment is needed, for the remedy is already in the law. During the Committee consideration, the Taft-Hartley Act had a provision which would have made unlawful a strike to compel the violation of any law. Its retention might have encouraged employer resistance to illegal demands.

3. Bypassing the Non-Communist Provision

In a series of cases, the NLRB has concluded that the law does not require it to look behind the curtain. To be in compliance, it is only necessary that the filing union's constitutional officers have made the affidavit. In the *Craddock-Terry* case, the Board refused an

offer of proof that the charging union had achieved compliance by abolishing the constitutional office of officers who had not made the affidavits while permitting the same individuals to exercise all of the prerogatives of the abolished offices. In the *Warshawsky* case, the Board again refused proof that the petitioning International union was not the real party in interest since a non-complying local would carry out the bargaining with the employer.

I believe a contrary decision could have been reached in both cases, but the responsibility is the Board's and it has opened an avenue around the Act's requirement unless reversed by the courts or corrected by Congressional amendment.

4. Union Shop and Welfare Funds

Many unions and some employers would like to eliminate the vote to authorize a union shop. They point out the great drain on the Board's time, the expense involved, and the fact that unions are winning these votes almost without exception and by very substantial majorities. The situation in the building trades where irregular short-time employment for which the voting requirement was obviously not tailored, is a further argument to dispense with the vote. A few unions have expressed a preference for the vote because an employer can no longer resist a union shop on the ground that he does not believe his employees want it.

Many of these arguments may lose validity with further experience. I suspect that unions are requesting the vote chiefly in those plants where their success is a certainty. The volume of such votes should reduce, since once authorized the parties may bargain for successive union shop contracts until the right is challenged by another vote.

The NLRB has now ruled that the duty to bargain on ". . . other terms and conditions of employment" includes a duty to bargain upon the union's request for employer contribution of welfare funds. By virtue

SEVEN KEY CASES UNDER THE NEW LABOR LAW . . . reported by

Cleveland Press

BEATEN UNION PRESIDENT LEADS STRIKERS BACK TO WORK IN A BODY

NON-FILING OF AFFIDAVITS

Case of Precision Castings Company

Under Taft-Hartley a Communist-dominated union finds at least one arm tied behind its back when it comes up against an employer who does not want to deal with such a union. Its vulnerable position stems as much from the readiness of so-called right-wing unions to move in as it does from employer resistance. What happened in Precision Castings Company plants is an example.

Until last winter, the CIO Mine, Mill, & Smelter Workers Union had bargaining contracts in the company's smelting plants in Kalamazoo, Cleveland, Fayetteville, N. Y. Officers of this union have not filed non-Communist affidavits which would entitle the union to the protection and assistance of the National Labor Relations Board.

This union is also among a dozen in the CIO believed to be under Communist influence. In fact, a CIO committee reported a year ago that the MMSW leadership let Communism interfere with the union's internal affairs.

When third-round wage negotiations came up, Precision management took a firm stand. It would not bargain with the CIO Mine-Mill union unless, and until, its officers complied with the non-Communist affidavit requirement of the new law.

When contracts expired, the union struck. This happened:

At Kalamazoo, the strikers didn't stay out long. They drifted back without a contract, without a union. MMSW couldn't keep them on strike.

At Cleveland, the AFL moved in. Using company employment rolls, AFL got in touch with every employee, signed up many. The CIO screamed: "Unfair." Management replied: "Our employment list is available to any union in compliance with Taft-Hartley." The state court restricted picketing. The CIO union couldn't make the strike stick. One by one, strikers went back. After seven weeks, the CIO gave up. Seventy remaining strikers tried to return in a body. The company told them to apply for

of a Taft-Hartley amendment, it is no longer necessary that an employer agree to a proposal or make a concession. Welfare funds are being increasingly demanded while employer resistance has kept pace with the demand. The new law's restrictions on such funds will be tested in the courts in a number of cases.

The Joint Committee has made such funds one of its major studies. Without as yet having the answers, I suspect this to be a field in which further legislation may be anticipated.

5. Industry-Wide Bargaining

When a labor organization obtains a virtual monopoly on the labor supply, it may combine with the employers so to eliminate competition that the only determining factor in fixing the price of the product is the highest price the public will pay. When the employers resist the union's demands, an industry-wide strike may be called with the same "public-be-damned" attitude.

Basically, there are two approaches when economic power becomes so concentrated that labor relations disputes can shut down entire vital industries. One is the approach used in dealing with inherent monopolies like public utilities—namely, strict regulation, perhaps seizure, probably compulsory arbitration. The other is to break up the concentrations of power by an approach similar to the Sherman Anti-Trust Act. In other words, to make industry-wide agreements and strikes and lockout subject to the anti-trust laws or else write a new law applying the anti-monoply principle to labor relations. The House of Representatives adopted that approach last year, but after my similar amendment was defeated on the Senate floor, the provision was eliminated in conference.

The coal strike was topped in April after great losses in production. But the Taft-Hartley Act provides no solution if settlement is not reached during an 80-day injunction period. That is unfinished business for the next Congress.

J. M. Gambatese, Labor Editor, Washington Bureau

BOYCOTTING THE NLRB

Case of Nashville (Tenn.) Corporation

Boycotting the National Labor Relations Board has proved costly for unions in many ways. At the Nashville Corporation in Nashville, Tenn., it cost the United Steelworkers of America-CIO, a chance to be bargaining agent for more than 1000 employees of the former Consolidated Vultee Aircraft Corporation (Nashville Division) plant. Most of them would be dues-paying members.

Instead, the steelworkers suffered utter defeat. The CIO union lost a 15-week strike, got hit with a $150,000 damage suit, and spent considerable money in a futile effort to save something from what was once a clean-cut triumph.

The story began early last year. As part of the southern organizing drive, CIO signed up a large bloc of employees in the plant, despite the fact that International Association of Machinists (Ind.) had represented the workers since 1940. It succeeded in getting NLRB to decide that a new contract signed by IAM and the company in February should not stand in the way of CIO's establishing its rights.

NLRB's poll of the workers on August 20—two days before the Taft-Hartley amendments to the Wagner Act went in effect—gave CIO a smashing victory over IAM, 903-464. Only 27 voted "no union."

Before NLRB could certify the results, the new rules were on the books. The board was barred from taking any action on the CIO petition because of the union's failure to comply with the affidavit requirements. It gave the union time their jobs individually. Meanwhile, AFL sought certification from NLRB.

At Fayetteville, both AFL and the right-wing CIO auto workers union stepped into the breach, breaking the strike. They got Precision management to agree to a consent election between the two unions. The incumbent Mine-Mill union tried to intervene, but was ruled off the ballot.

Robert C. Holt, Jr., Nashville Tennessean

POLICE WITH TOMMY GUNS GUARANTEE NON-STRIKERS FREE ACCESS TO PLANT

to make up its mind on compliance. Finally, in November, it dismissed the case.

Meanwhile, the steel union tried to force Nashville Corporation to give it voluntary recognition. The management, as well as IAM, stuck to an earlier position—that there was a valid contract in effect with IAM running until March. Rebuffed, CIO called a strike on November 10. Members of IAM ignored it, walked through picket lines. Violence broke out on many occasions. State police tried to maintain order. Arrests were made.

The Nashville Corporation took three steps:

1. It filed a charge with NLRB accusing CIO of committing an unfair labor practice under Section 8(b)(4)(C)—forcing the company to recognize CIO when another union, IAM, has been certified. (NLRB General Counsel Robert N. Denham refused to issue a complaint, holding that the August election had nullified IAM's certification of 1940.)

2. It filed the $150,000 damage suit against CIO in the U. S. District Court in Nashville, alleging that the strike was an unlawful one.

3. It obtained a temporary injunction from the state court limiting the number of pickets.

The IAM made one move: It asked for a new election.

The CIO countered by calling off the strike on February 24. It tried to get its members back in the plant, and when the company balked on some of them, charges were filed by 140 strikers accusing the management of coercion and discrimination. Charges are still pending.

The CIO also tried to block another election. It cited the Taft-Hartley rule against more than one valid bargaining election every 12 months. A new election, CIO argued, could not be held until August.

NLRB rejected this view. It said last August's election was not a "valid" one; it was only part of an uncompleted investigation of the steel union's claim of bargaining rights.

The board directed that another election be held. A question arose as to whether the 140 strikers not rehired could vote. The Taft-Hartley law provides: "Employees on strike who are not entitled to reinstatement shall not be eligible to vote." NLRB permitted them to vote, with the proviso that their ballots be segregated and not counted unless they would have a bearing on the result. In that event, it would first have to be determined what strikers were entitled to reinstatement before deciding which ballots could be counted.

This will not be necessary. The election, held April 30, left no doubt of how the employees felt—CIO got only 94 votes; IAM polled more than ten times as many—968.

EMPLOYERS' FREE SPEECH

Case of General Shoe Corporation

The new law specifies that an employer's expression of opinion shall not be evidence of an unfair labor practice unless it contains a "threat of reprisal or force or promise of benefit."

Doubt has been cast on the effectiveness of this provision by NLRB's decision in the General Shoe Corporation case. The board majority did not find the management guilty of an unfair labor practice. But it achieved the same result by voiding the collective bargaining election concerning which the employer expressed his views, and directing that a second poll be taken. It could have done little more than that if an unfair labor practice had occurred.

Now the AFL Boot & Shoe Workers Union, which lost the election in the company's Pulaski, Tenn., plant by a 418-163 vote, will get another chance.

Crux of the complaint against General Shoe: (1) Foremen went to the homes of employees to propagandize against the union; (2) on the day before the election, the employees were brought into the president's office in groups of 20 to 25 to hear his views on the union. Workers were told of the disadvantages of unions—that they cause trouble in the plant, and strikes. Racial questions also were raised.

Conclusion of the board's majority: The company's conduct "went so far beyond the presently accepted custom of campaigns directed at employees' reasoning faculties that we are not justified in assuming that the election results represented the employees' own true wishes."

SEPARATE CRAFT UNION

Case of Harnischfeger Corporation

Except for operating engineers, production and maintenance employees of Harnischfeger Corporation had for eight years been represented in collective bargaining by the United Steelworkers of America, Local 1114, a CIO affiliate.

The engineers already were bargaining through their own union, the International Union of Operating Engineers-AFL, when the steel union was certified by the National Labor Relations Board as bargaining agent for the other employees in the company's electrical equipment plant in Milwaukee. They continued to do so.

A small group of eleven pattern makers in the company's pattern department would have liked the same privilege. Under the Wagner Act, they could not get it. They were destined to remain part of the plant-wide group represented by the CIO industrial-type union. Highly skilled craftsmen, the pattern makers wanted to bargain for themselves.

Naturally, the pattern makers didn't like being the tail of the CIO dog. By 1944, after five years of CIO, these workers stopped using the CIO bargaining committee to adjust their grievances. Instead, they went

directly to the shop foreman. Once, by appealing from the foreman to the works manager directly they got a wage increase 2½ cents higher than that won by CIO for the whole bargaining unit.

Last year the Pattern Makers' League of North America-AFL petitioned NLRB for certification as bargaining agent for the pattern makers. Eight of the eleven had joined this AFL union. Both the company and CIO opposed separation of the pattern makers from the other workers. They cited the historical background of bargaining on a plant-wide basis.

But NLRB found that "the pattern makers comprise a highly skilled craft group" employed in an industry in which separate bargaining units of pattern makers are prevalent. It decided that the pattern makers could "at this time" constitute a separate unit if they so desired.

It directed an election to determine their wish. All eleven pattern makers voted for the Pattern Makers' League. Accordingly, NLRB set up a separate bargaining unit for them and certified this union as their representative. The pattern makers are now in a position to bargain for themselves and sign their own contract.

NATIONAL EMERGENCY STRIKE

Case of the Soft Coal Industry

Congress aimed two parts of the Taft-Hartley law at one man: John L. Lewis.

If it did nothing else, Congress wanted to make sure it brought the truculent head of the United Mine Workers within reach of the new labor-management law when it passed it last June 22 over President Truman's veto.

To cope with economy-crippling coal strikes, Congress inserted a new disputes-handling technique under the heading: "National Emergencies." This called for a board of inquiry, injunction against strike, and an 80-day cooling-off period at the end of which the employees vote on the last offer of management.

For good measure, Congress added a second Lewis-inspired regulation: Joint administration of employer-supported union welfare funds. The United Mine Workers Welfare and Retirement Fund was accumulating $25,000,000 a year from a 5-cents-a-ton (later 10 cents) royalty contributed by the mine operators. Congress wrote strict rules intended to protect the interests of individual miners in the fund.

The first test of how the law would stand against the power and cunning of Lewis came sooner than expected. Congress watched it with eager interest.

As he had done so many times before, Lewis went to the mat first with the operators. Then with the government. The issue was not wages or hours. Nor union security. Nor was it even the principle of pensions for miners. That had been decided when the contract was signed in July. The issue was: How *much* pension to *which* miners?

When 350,000 miners stopped work on March 15, Congress saw the law begin operating on both of the anti-Lewis provisions. The strike created a "national emergency." It also involved disagreement over the administering of an employer-supported welfare fund.

With the stoppage a week old, Truman invoked the first step of the emergency machinery: A three-man board of inquiry was named to inquire into the issues.

Acting on the board's report, Truman asked Attorney General Tom C. Clark to get an injunction. The court issued a temporary restraining order directing Lewis and the union to end the strike "forthwith." Lewis balked. He stood on this technicality: He did not call a strike and no strike existed. So how could he end it?

Within a week, the government sought a contempt citation. Events moved fast. Overnight, Sen. Styles Bridges, the new impartial trustee, came up with a pension plan that Lewis accepted as a tentative program. Van Horn dissented, but was outvoted. Lewis then notified his district officers of the pension decision—a signal to end the strike.

These developments only a few hours before Lewis appeared in court to answer the contempt charge did not impress Federal Judge T. Alan Goldsborough. They came a week too late. The judge ruled that Lewis had in fact called a strike indirectly without use of the word "strike." He described two Lewis letters to the miners as a code signal for striking. He also decreed that a union "must be held responsible for the mass action of its members."

Lewis and the union were convicted of criminal and civil contempt for not ending the strike immediately. The fine: $1,400,000 against the union; $20,000 against Lewis—for criminal contempt.

Judge Goldsborough withheld imposition of sentence for civil contempt, thus holding a club over Lewis and the union while the 80-day injunction, issued April 21, is in effect.

The Taft-Hartley law calls for mandatory dissolution of an injunction when the dispute is settled. Although most of the miners returned to work after a 4-week strike, the judge denied Lewis's plea for dropping the injunction. The reason: A dispute still seemed to exist over the pension payments.

The Bridges pension plan was tied up in the courts by Van Horn. He sought an injunction to prevent payment of the $100-a-month pensions to miners 62 years old, with 20 years' service, who retired since May 29, 1946. He argued that the plan was actuarially unsound and failed to consider other welfare functions. More important, he contended, the plan violated the law by including pensions for members of the union employed by operators who contributed nothing to the fund. These operators had not signed the national bituminous contract.

Under Taft-Hartley, an employer may contribute to a welfare fund only if its benefits go exclusively to his employees and their families.

Appraising the impact of the Taft-Hartley law on the coal situa-

tion, these points stand out (assuming Judge Goldsborough is upheld in the higher courts):

Lewis can't avoid responsibility for a coal strike by his "no-contract-no-work" strategy. A strike is a strike, no matter what one calls it.

A coal strike can be ended by an injunction.

The courts must decide whether the miners' pension plan conforms to the law.

With his pension plan, Lewis has a stronger union shop than he could get if he filed a non-Communist affidavit and got a union shop contract under the law. Here's why: The pensions will go only to members of the union.

INQUIRY INTO "EMERGENCY"

Case of the Meat Packing Industry

The strike of 80,000 CIO-represented packinghouse workers against the five largest meatpackers —Swift, Armour, Cudahy, Wilson, and John Morrell—was the second labor dispute in which President Truman resorted to Taft-Hartley's emergency procedures.

Deviating from what he did in the soft coal situation, Truman did not seek an injunction after the board of inquiry reported to him. The reason: A month's strike disclosed that, actually, no emergency existed. National health and safety were not imperiled. The strike affected only a fourth of the industry's meat production. Most of it was being made up in other packing plants, including the same companies, organized by AFL and independent unions.

The CIO union's position was not helped by the inquiry board's finding that the 9-cent hourly increase offered by the packers—and accepted by the other unions—was a "substantial" increase which would compensate for the rise in cost of living since the previous contract was signed. The CIO was insisting on a 29-cent raise based on the city workers' family budget prepared by the Bureau of Labor Statistics. Denial of a third-round wage increase in the steel industry further weakened the union's stand.

The CIO's strategy had boomeranged. Union leaders had looked for an injunction to end the strike without losing "face," although they would have been first to denounce its use. They saw their mistake: By striking, they proved that no emergency existed. If an emergency developed later, the President would still be in position to seek an injunction.

CLOSED SHOP EVASIONS

Case of the Printing Industry

The old-line International Typographical Union has long cherished its closed-shop contracts covering 92,000 members in the country's newspaper composing rooms and commercial printing shops. So it decided to lead the search for ways to get around the closed-shop ban in the Taft-Hartley law.

The union's Cleveland convention last August came up with this strategy: The union would post "conditions of employment" in the shops, stipulating the terms under which the members would render services to the employer. One of the conditions: ITU members would not work with non-members. And, not having a contract, the union would be free to strike at will.

The first major test came in Chicago. The five major newspapers insisted on a contract. A strike began November 24 and was still on in May, although the newspapers continued to publish. They used a photo process which dispensed with printers.

As more employers resisted, the ITU retreated just a bit. It offered contracts without a closed shop, but for only 60-day periods. The reason: So it could strike on short notice if closed-shop practices were not observed voluntarily by the employer.

Management resistance continued. By March, a clause acceptable to the ITU had been worked out with the commercial printing employers in New York and put in a contract. The employers agreed to hire only those printers who could prove a "high degree of skill."

Here was the catch: The union had a voice in determining "skill." A skillful printer would be one who (1) carried an ITU card; or (2) completed an apprenticeship course conducted jointly by union and management; or (3) held a certificate of competency from the examining board of New York's School of Printers' Apprentices (a union-management program).

Printing employers in other parts of the country labeled it a dodge of Taft-Hartley, refused to go along with it.

Among the actions listed as violations of the law in the first court test: Demanding unilateral conditions of employment, insisting on closed shop conditions, insisting on 60-day cancellation, asking employers to discriminate against non-union employees.

A second blow was dealt by an NLRB trial examiner when he found that ITU Local 12 in Baltimore was guilty of refusing to bargain by insisting on imposing the union's policies on the 22 commercial printing companies in the Graphic Arts League. He recommended that ITU be required to change its constitution so as to conform with the Taft-Hartley law.

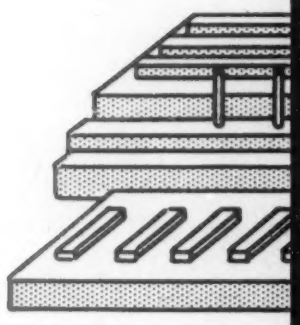
It has not been all trouble for the union. ITU President Woodruff Randolph claims 800 wage settlements have been reached since it set out to fight the new labor law. But in most of those cases decision on non-wage issues like the closed shop was deferred.

There can be no question that the Taft-Hartley law has upset labor-management relations in an industry that has boasted a comparatively peaceful record. But the choice was the union's.

PRODUCTION FLOW CHART

5. AUTOMOBILES

FORD MOTOR CO., DEARBORN, MICH.



OP

THE Ford Motor Company starts with raw material and produces the finished product. The Rouge plant alone consists of 12 manufacturing buildings, grouped into a single industrial unit covering 1196 acres. In the subsidiary buildings, complete manufacture of major and minor subassemblies takes place before all finished parts come together on the final assembly line.

Only about 10 per cent of the parts manufactured at the Rouge are finally assembled there. The rest are sent to 14 assembly plants located in other sections of the country.

1. **Manufacture of steel.** Ten open-hearth furnaces make steel for the rolling mill. Molten metal is poured from a tilting open hearth furnace into a 185-ton ladle, then through a pouring dish with four outlets into ingot molds on a special railroad car.

2. **Steel rolling.** Cherry-red, 10-ton ingots from the soaking pits are rolled in a 44-in. blooming mill. Sheet steel is rolled for fenders, hoods, and body panel sections. Most bar stock is used in the manufacture of springs and forgings.

3. **Frame manufacturing.** Drop-center, box-section chassis frame is cut from steel blank by one of 140 presses. It is then formed into a channel section and pierced. A 48-ft.-long machine welds inner and outer channels into a box-section side member. Frame assembly is done on moving conveyors.

4. **Gears and axles.** Parts are both manufactured and assembled

Differential gears, for example, begin as forged blanks, are machined, and finally gear teeth are cut in by automatic machines. Completed passenger car rear axle assemblies are inspected and run in soundproof rooms. If assemblies pass tests, they are painted and shipped either to "B" assembly building or branch plants.

5. **Press shop.** Sheet steel is formed into automobile body sections. Flat stock is transformed into a completely drawn, one-piece roof top in a few seconds.

6. **Body welding.** Pressed steel body parts are welded together in the body construction department, resulting in what is called a "body shell." The body shell is then sent to the "B" building for final metal finishing, painting, and body trimming operations.

7. **Production foundry.** Molds are brought to the metal, instead of the metal being taken to the molds. All hot-metal pouring and core-making is done on the move. Engine blocks are poured into molds which move along on a continuous, conveyorized casting line. Smaller parts cast include crankshaft, camshaft, cylinder head, valves, water and oil pumps.

8. **Foundry machine shop.** Most parts cast in the production foundry are machined here. Machine operator removes rough block from moving conveyor and, after all operations have been performed by a particular machine (or a number of operations have been completed by a transfer-machine), replaces it

on conveyor which take
to next machining opera

9. **Engine assembly.**
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engine is "run in" by
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10. **Body painting.** I
department, bodies are c
steam and chemicals, sa
and prime coated. The
dried by passing through
infra-red ray lights, sp
two coats of enamel, and
in a baking oven.

11. **Body trim and up**
the trim shop, the bod
window glass, instrument
seat assemblies. Cushions
head lining, carpets, an
are added.

12. **Motor dropped**
Engine meets passenger
on final assembly line in
ing. An engine is lowere
balcony for each chassis
along conveyor.

13. **Body dropped**
Finished body meets cha
body drop station on fina
line. The body is lowere
balcony as chassis moves
veyor line.

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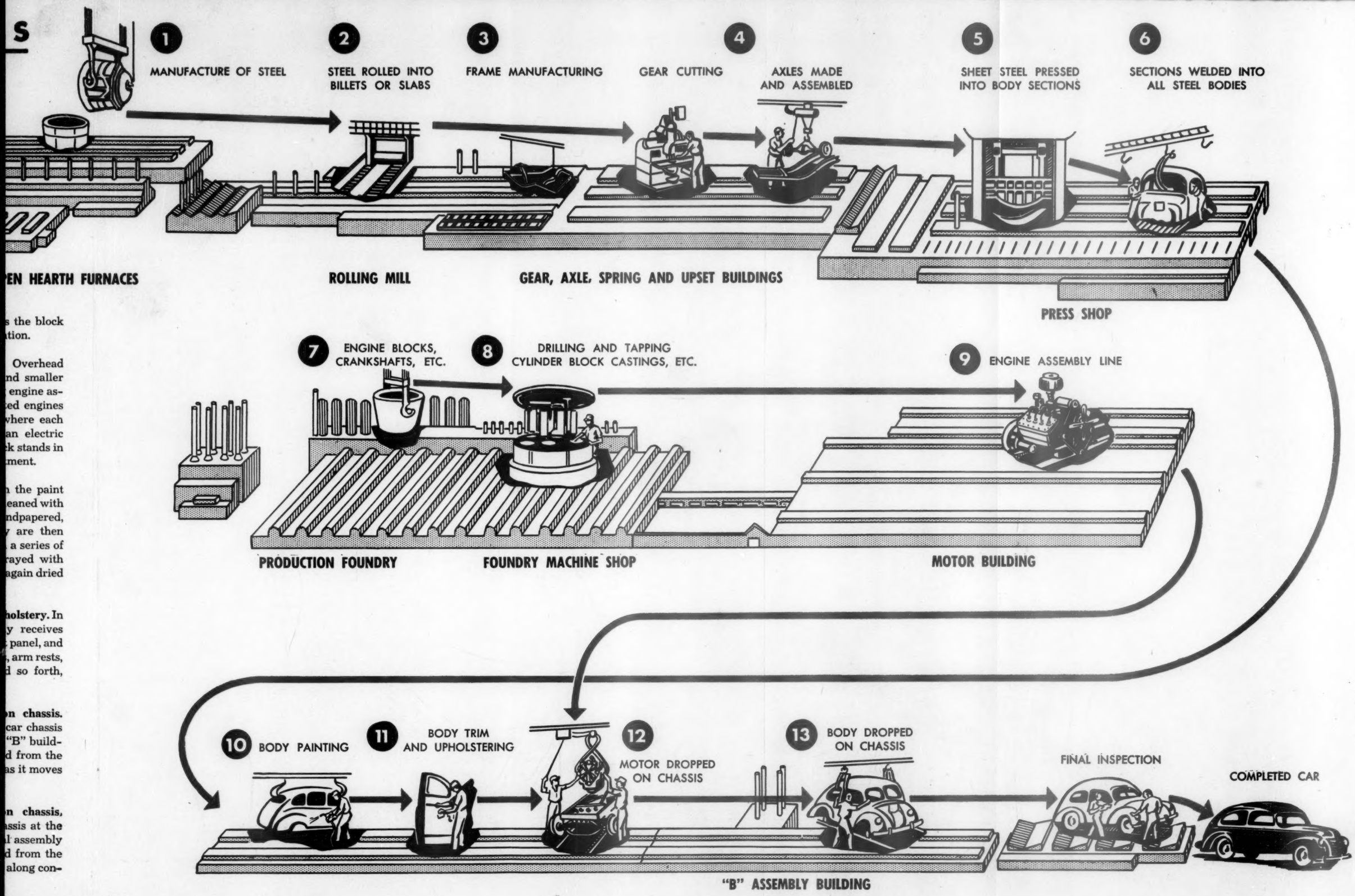

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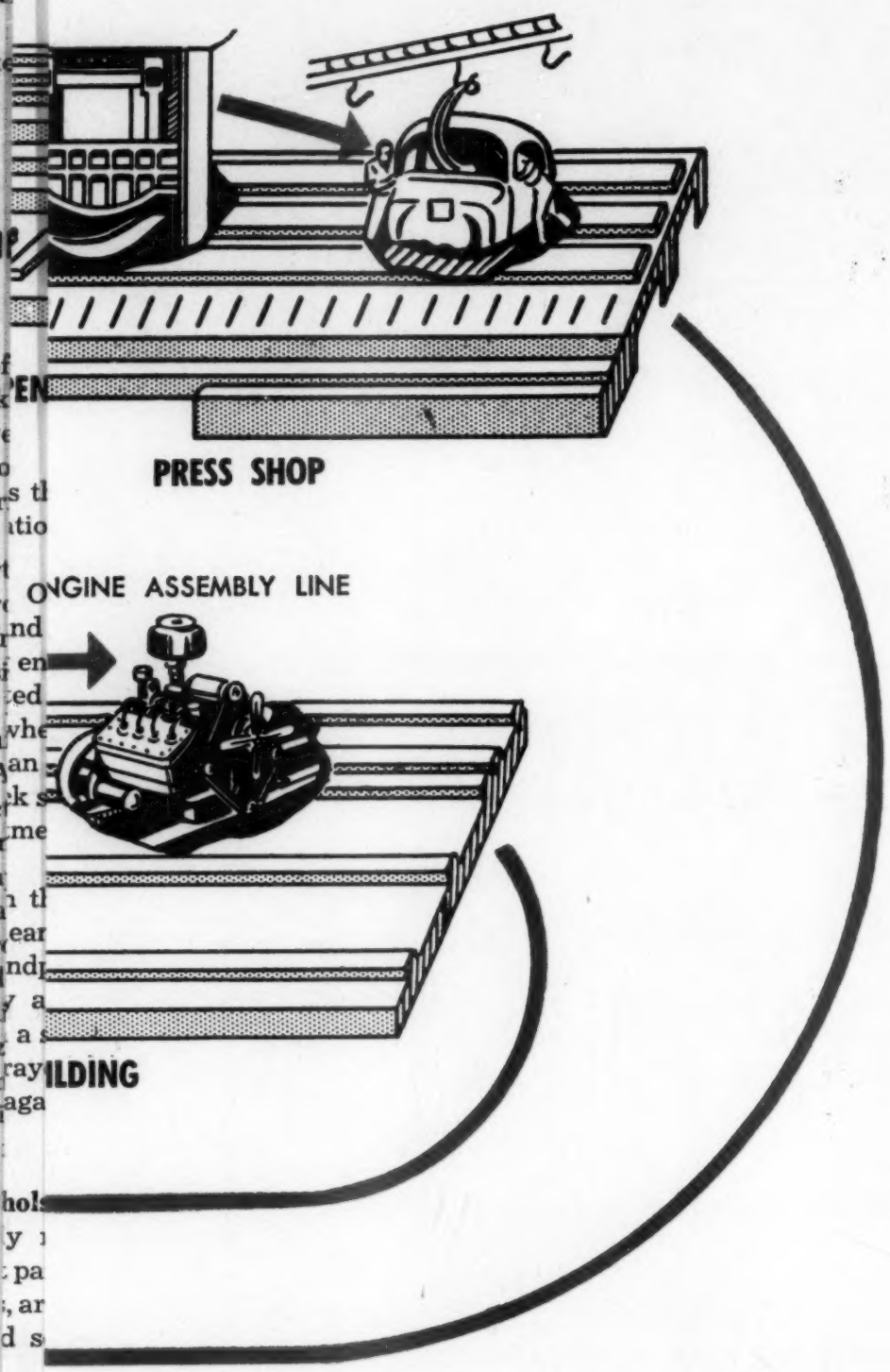


A SAFETY PROGRAM THAT OVERLOOKS NOTHING

Integrated, 16-point safety program can be basis of comprehensive policy in any plant, large or small

JOHN E. KANE • SUPERVISOR OF SAFETY, FISHER BODY-TERNSTEDT DIVISION GENERAL MOTORS CORPORATION, TRENTON, N. J.

MACHINES do not cause accidents. It is the human beings who operate and maintain them that really cause the accidents and injuries. Only through the constant and repetitive *training* of employees, *engineering* of better work methods, and *enforcement* of shop rules and regulations can such injuries be prevented.

At the Fisher Body-Ternstedt Trenton plant this is accomplished through a "planned" safety program involving various methods for (1) teaching safety to new employees; (2) continuing safety consciousness in all employees; and (3) checking and eliminating accidents.

The principal elements of this program are outlined below:

Employee training. When an employee has been hired, he is given, by the employment interviewer, a safety instruction manual for the job on which he is placed. He is instructed to become familiar with its contents.

On the first day of work, new employees are taken to a conference room, where a program of indoctrination is conducted for about half an hour. Here the employees are given a short summary of plant rules and regulations, employee services, and a session on safety as it pertains to the work in this plant. They are taken on a tour of the plant, and are introduced to their foremen.

Each foreman explains necessary departmental information. He also gives the employee specific information on the job he is to do, bringing out all safety factors of the job, the type of protective equipment required, the guarding on the machine, and detailed instruction on operations. The employee is then ready for work; but follow-up work on part of foreman is necessary.

Some time before the expiration of ten days, the foreman gives his new employee a "quiz" on the information shown in the safety instruction manual for that job, to determine if the employee is fully qualified to do the job.

The safety department later gets in touch with each new employee and again gives him a "quiz" to determine how much he has learned about his job.

It should be noted that when employees are transferred from one job to another, the foregoing indoctrinational routine is repeated.

Monthly inspections. A foreman, a job-setter, and a safety inspector team up and make an inspection of a department. The foremen and job-setters are selected from another department; not the one being inspected. Each department is inspected each month by a different team. They look for and record such things as unsafe acts, housekeeping, materials handling, equipment, presses, condition of mechanical equipment and mechanical safeguarding, wearing apparel, hand tools, and so forth.

In order to make scoring standard and equitable in all departments, a list of "standard deductions for committee inspections" was prepared which gives the inspection team a list of things to observe and the deduction or charge to make for each item. As items are enumerated and deductions added, the total deductions are subtracted from a 100 per cent to get the percentage for that department.

A committee inspection follow-up form is filled out by the foreman of the department inspected. It lists the corrective action he will take on items found out of order in his department. Management receives copies of all inspection reports and reports of action taken.

Point-of-operation guards. Until such time as human errors are completely eliminated, point-of-operation guarding will be necessary. Many factors must be considered in planning various types of guards. Among these factors are type of operation, dies, mechanical or manual feeds, and proper visibility. Also, the guard designer must consider obstruction, fatigue, and glare.

Thus it can be seen that guards must be tailored to each plant and to each operation.

Relocation of equipment. In order to keep everyone concerned cognizant of the importance of safety in regard to the installation of machines, a manila relocation tag was designed. It serves also on new equipment.

This tag is placed on a piece of equipment before any action of any sort is taken. In the case of new equipment, the tag is placed on the equipment at the receiving dock by the engineer in charge. If the equipment is to be relocated, it is put on *at the point from which it is to be moved.*

The equipment is then placed into position according to layout, and the various trades perform the necessary hook-ups. The head of each trade involved then signs the tag to certify that his trade's installation was according to standard, and that all safety factors were followed.

The next step in the procedure is for the production foreman in charge of the machine and the maintenance foreman to get together and try out the equipment. If satisfactory to both of them, they also sign the tag.

A safety engineer checks for all

DEPARTMENTAL COMMITTEE INSPECTION REPORT

DATE OF INSPECTION 4-14-48 AREA INSPECTED: Dept. 4

TEAM: F. E. (Dept. 11); J. N. (Dept. 4)

ACCOMPANIED BY: C. K.; A. L.; L. L.

TO: Messrs: E.J.H., L.R.S., W.F.B., R.E.W., J.A.G., J.T.

CC: Messrs: A.L., E.C., J.K., J.K., C.K., E.B., E.J., L.M., file

ITEMS FOUND	DEDUCTIONS
1. Pipe lying on floor at Col. G-52 -- tripping hazard	1.
2. Stock tray not properly secured to press A-2½ #11545 -- Col. I-49	1.
3. Lunch, etc., lying under press -- A-3 #11610 -- Col. I-49	.5
4. Foot pedal too low on 5-a press #655 at Col. L-49	1.
5. Employee #4-1019 operating a portable grinder and not wearing safety goggles	2.
6. Pushbutton switch needs repair on 4 press #12917 at Col. G-55	1.
7. Back guard not secured properly on Lathe #479 at Col. H-55	.75
8. Fire extinguisher at Col. I-50 blocked by pallets	1.
9. Employee #4-1008 working under a suspended load of moldings at Col. C-50	2.
10. Power drive guard not properly secured to polisher. Cord used to keep it in place at Col. R-52	1.
11. Consolidated 81-H clutch mechanism defective. Non-repeat does not function properly at Col. S-48 -- Equipment #TTD 12431	1.
12. A-5 Press TTD #8108 left running unattended	1.
General Housekeeping -- Good	86.75%

Recommendations:

1. Monorail system in area around Col. Y-40 should be cleaned of the thick coating of dust and lint
2. Suggest installation of slug chutes for lock line presses at Col. I-40 to Col. I-48

EACH DEPARTMENT UNDERGOES A THOROUGH SAFETY INSPECTION ONCE A MONTH. COMPLETE REPORT (ABOVE) IS FILED BY

safety standards: Layout, electrical, air, guards, and so forth. Any discrepancy must be remedied before he signs, and equipment may not run without his signature.

Last, the plant engineer in charge signs the tag, certifying that the procedure has been fulfilled. He removes the tag and files it against the equipment number in the engineering department.

"Danger tag." An important phase of any safety program is authority to stop equipment if it is considered unsafe to the degree that employees are in personal danger.

To accomplish this, a "danger tag" was designed. It is made up in three sections, and perforated so that each section may be detached. The original or top section remains with the equipment or process tagged out. The second goes to the department head immediately to notify him of the action. The third copy is a file and follow-up copy for the safety department.

Immediately upon having taken the action to tag out a machine or process, the safety engineer involved issues a memorandum explaining his action.

The foregoing action stops the

COMMITTEE INSPECTION FOLLOW-UP

DATE OF INSPECTION 4-14-48

AREA INSPECTED: Department 4 SECTION All

To facilitate follow-up by the Safety Department, will you kindly list below the action taken on the items found during the Committee Inspection of your department. This information is desired *within ten days* from the receipt of this report.

ITEM NO.	ACTION TAKEN
1	Pipe removed
2	Corrected
3	Employee concerned instructed to keep her lunch and personal belongings in her locker
4	Foot pedal adjusted to proper height
5	Employee #4-1019 reinstructed
6	Repaired
7	Repaired
8	Corrected
9	Layout of work area changed. Crane operator instructed not to leave loads suspended
10	Corrected
11	Press tagged out and turned over to maintenance department for repairs
12	Employee #4-1009 reinstructed not to leave her press running while she is away from job
	Recommendations:
1	Sanitation department to vacuum clean all monorails during this week-end
2	Plant engineering is investigating and will follow up on installation of slug chutes

J. M.
Superintendent #4
4-16-48

INSPECTING TEAM. DEPARTMENT FOREMAN MUST NOTE ON A FOLLOW-UP SHEET THE ACTION TAKEN ON EVERY ITEM

cause for an unsafe condition immediately, and, until the cause is eliminated, the equipment or process cannot function.

After the cause for the unsafe condition has been eliminated, the procedure goes into its final phase. A safety engineer is called to inspect the correction made. If the condition is satisfactory, he removes the tag, and files it in the safety office. Note that *only* the safety engineer may remove the tag.

However, the safety engineer is not the only person who has authority to *stop* equipment. Anyone, and that includes the operator, can shut down a job if he feels it is dangerous or unsafe to operate.

Maintenance tag. Each maintenance man is charged with the responsibility of placing a maintenance danger tag on any equipment he is repairing. The tag must have the reason equipment is shut down, employee's name, badge number, division of maintenance, and date equipment was tagged.

Further to insure safe working conditions, the maintenance man is required to lock out the electrical control switch on the equipment

MINIMUM SAFETY STANDARDS FOR JOB CLASSIFICATIONS REQUIRING EYE PROTECTION

Job Classification*	Minimum Approved Protection
1. Alloy Tester and Weigher	Side shield goggles or face shield
2. Automatic Operator — Polish or Buff	Goggles or face shield
3. Boring	Goggles or face shield
4. Boring Mill Operator	Side shield goggles or face shield
5. Box Maker	Goggles or face shield
6. Burring, Mechanical	Side shield goggles or face shield
7. Chipping	Side shield goggles
8. Cleaning — Acids	Splash proof or side shield goggles
Degreasers	Side shield goggles or face shield
Equipment	Side shield goggles
Caustic	Splash proof or side shield goggles
Paints	Side shield goggles or face shield
Solvents	Splash proof or side shield goggles
Tanks	Side shield goggles
9. Die Cast Operator or Inspector	Side shield goggles
10. Die Cast Die and Machine Setter	Side shield goggles
11. Die Cast Crane Operator	Side shield goggles
12. Die Cast Melter	Side shield goggles
13. Die Cast Helper	Side shield goggles
14. Drill Operator	Side shield goggles or face shield
15. Grinding Operations	Side shield goggles
16. High Speed Hammer	Goggles or face shield
17. Kingsbury Automatic Mill	Goggles or face shield
18. Keller Operator	Goggles
19. Lathe Operator	Side shield goggles or face shield
20. Loading — Acids	Splash proof or side shield goggles
Caustics	Splash proof or side shield goggles
Fire Extinguishers	Splash proof or side shield goggles
21. Milling Machine Operator	Goggles or face shield
22. Operator and Helper — Barrel Room	Goggles
Bonderize	Goggles
Heat-Treat	Side shield goggles or nitrometer mask
Washing Machine	Goggles or face shield
23. Plating Machine Attendant and All Plating Operations	Splash proof or side shield goggles
24. Polish Wheel Set-Up and Helper	Goggles or face shield
25. Roll Mill and Polish Operator	Goggles or face shield (when operating polish machine)
26. Sanding, Mechanical	Side shield goggles or face shield
27. Sawing, Metal	Side shield goggles or face shield
Wood	Side shield goggles or face shield
28. Shaper Operator	Side shield goggles or face shield
29. Slotter Operator	Goggles or face shield
30. Solution Attendant	Splash proof or side shield goggles
31. Solution Tester	Splash proof or side shield goggles
32. Spring Winder Operator	Goggles
33. Stripper	(Same as all plating operations)
34. Tapper Operator	Goggles or face shield
35. Tool, Die and Machine Setter — (All Punch Presses)	Goggles
36. Welders — Arc	Hood (arc weld type) and goggles
Gas	#6 or #6 gas welding goggles
Spot	Side shield goggles
37. Wire Brush	Side shield goggles or face shield
38. Riveters	Goggles or glass guard

*Anyone performing other than the above mentioned operations such as inspectors, timekeepers, supervisors, etc., shall wear the prescribed eye protection when in the immediate vicinity of such operations

EYE SAFETY STANDARDS ARE TYPICAL OF THE THOROUGH SAFETY REQUIREMENTS ESTABLISHED FOR EVERY JOB AT TERNSTEDT

being repaired. When the repair work has been completed, the maintenance man removes the tag and lock prior to releasing the equipment back for production.

Safety report. When a safety man notes something out of order on a piece of equipment, it is necessary to notify the proper people. This is done on a "safety inspection report," made out in triplicate This form belongs exclusively to the safety man, and is a part of his regular responsibility.

The white copy is given to the departmental superintendent or general foreman; the yellow copy goes to the foreman directly in charge of the area affected by the report; and the pink copy is retained by the safety inspector for follow-up.

Protective equipment. The wearing of protective equipment, such as gloves, goggles, aprons, is dictated by the nature of the operation. The responsibility for allocating the necessary protective equipment rests with the foreman. However, he consults the safety department on new operations.

Protective equipment such as gloves and aprons are issued to the department head, on a budget basis set up through job analyses. Goggles, face shields, and the like, are issued at stock cribs on individual tool slips. To receive new protective items, the employee must return the worn-out item.

Respiratory equipment. Respirators are considered as the last line of defense against dust and gases. Management assumes the responsibility of removing or controlling the source of these contaminants. However, in some instances the operations are of a temporary nature; to install a ventilating system would be impracticable for the short duration of these operations.

In order to safeguard properly employees working on operations requiring respirators, the selection, type, sterilization, and storing of respirators is very important. Employees may obtain the proper type respirator from stock cribs on the foreman's approval.

Safety suggestions. No one knows the operation of a piece of machinery or job assignment better than the employee who has continuously performed the operation.

The safety suggestion is handled in the same manner as a production suggestion. Each suggestion is thoroughly investigated, and cash awards are made to employees whose suggestions are adopted.

Safety talks. To instill safety thinking through supervision and employees, each foreman is required to give a 5-min. "safety talk" each month to each of his employees. He may speak about any pertinent items confronting his particular department.

Suggested subjects are issued by the safety department every month. However, the selection of topics for safety talks is not limited to the subjects suggested by the safety department. Each month a safety department representative spot checks the entire plant, making sure of these talks by supervision.

Accidents. Whenever an accident occurs, a definite 5-step procedure is followed. No matter how minor the accident, no step may be eliminated. Failure of an injured employee to report for a hospital check-up (even though no treatment *seems* necessary) is particularly dangerous.

1. The injured reports to plant hospital where doctors and nurses are always in attendance while the plant is in production. Complete facilities are available in the plant hospital to take care of any emergency, including a fully equipped operating room, X-ray, diotherapy, short-wave, pulmotor.

2. The job or machine on which the accident occurred is immediately stopped. Nothing is touched until a complete accident investigation is made. Pictures may be taken.

3. If the accident is of a serious nature, members of management are notified immediately, and in many instances participate in the investigation.

4. The cause of the accident is determined, the condition is corrected, and accident reports are made up by two interested persons. The first is made up by the foreman whose employee was injured; the second by the safety department. Both reports are distributed to members of management, engineering, and others interested, before the completion of the shift on which the accident occurs.

5. A follow-up is made in other sections or departments of the plant where similar conditions may prevail.

It should be noted that the above conditions also apply where the accident is minor and no injury results. Accidents which fortunately hurt no one are major clues for the correction of the conditions *before* some one is injured.

Monthly report. To acquaint supervision with what has transpired during a past month in respect to different types of accidents, a monthly report is made up. This report consists of a brief review of the more serious accidents, involving injury or non-injury. It is felt that through a recapitulation of past accidents, supervision can utilize the information presented to prevent similar accidents within their own jurisdiction.

The report also incorporates a bit of competition through relative standings in frequency and severity rate comparison. The records, available in the safety office, are used to determine each department's frequency and severity, and they are listed in order of standing. This is done for the month and for the year to date, and gives an accumulated picture of how the departments are progressing. Foremen can compare their records with the plant average, which also is listed.

The reports are sent to every supervisor in the plant and are delivered within the first ten days of the month.

Statistical control. Every reported injury is investigated immediately and a record by name and badge number, a cross-index by type of injury, and an index of cause analyses are maintained in a statistical control file.

This type of filing offers innumerable advantages in the compilation of statistical information on accidents and injuries. For example, in a matter of seconds it is possible to know how many injuries were caused because of poor judgment on the part of the injured employee, or because of improperly designed guards, or how many eye injuries were received through lack of wearing eye protection.

In all, 14 main accident cause classifications are listed, with 77 indexes, through which practically any type of injury can be classified.

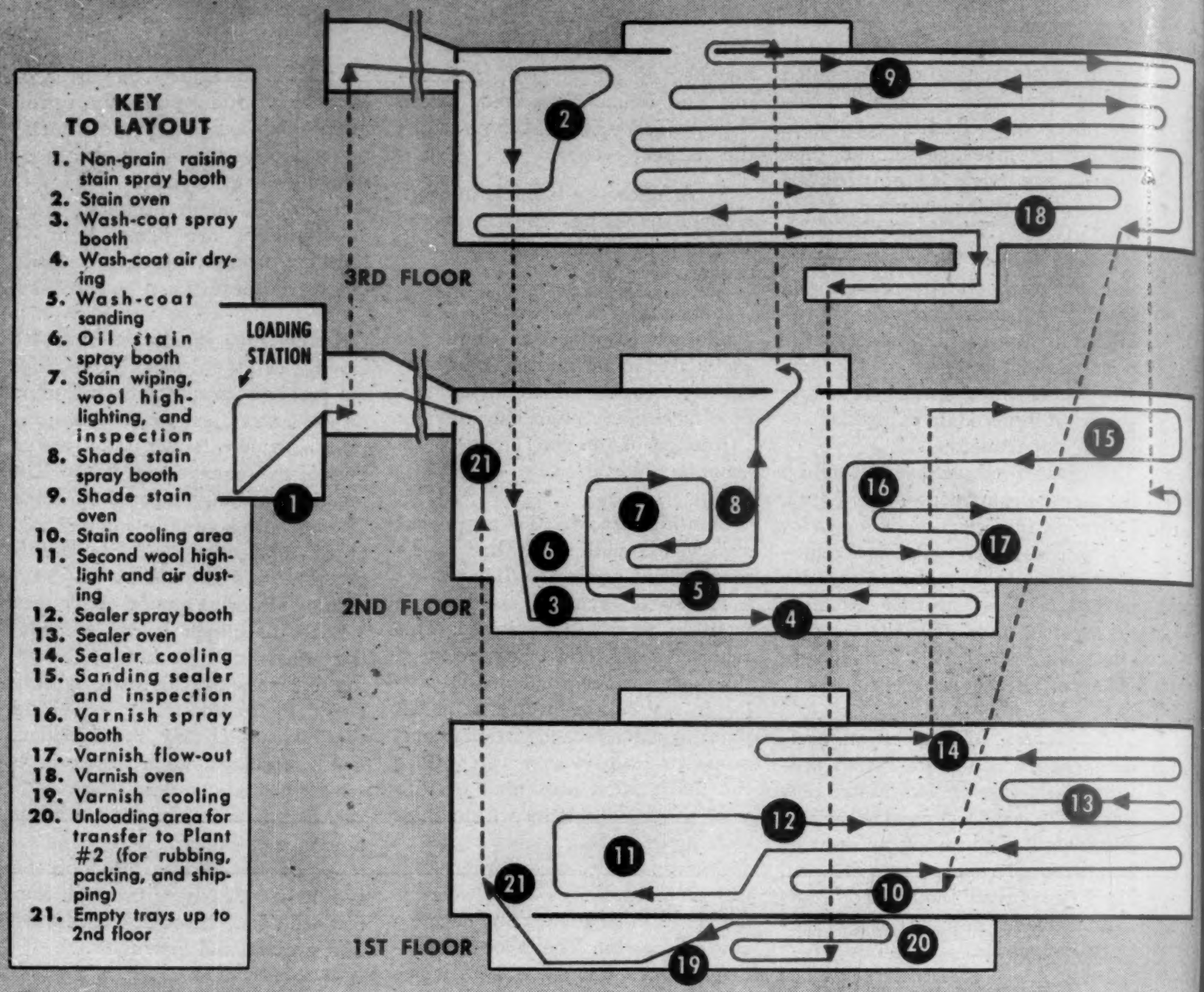
Supervisory meetings. Over 400 employees attend weekly meetings on accident prevention, including all job-setters, leaders, foremen, engineers, superintendents, and members of the management group. The meetings usually last 45 minutes. The purpose is to talk "plant standards," to discuss accidents, unsafe practices, and to build up a "safety-minded" interest among employees.

Each discussion leader compiles the information for his own meeting. He arranges his own exhibits and demonstrations for the group, to illustrate clearly the problems being discussed. Each leader is an expert in his own field. Because of this fact, it is felt that those in attendance at this type of meeting are more interested, and the problems are more clearly presented than could be done through the services of a professional instructor.

Health committee. The need for a health committee was recognized in the early history of the plant. Its need was derived mainly from problems involving ventilation, lighting, dermatitis, cafeteria services, and improving working conditions from the health angle.

At its inception, it was agreed that all persons who could contribute toward the improving of health conditions should be members of the health committee. They include the plant manager, medical director, personnel director, plant engineer, chief chemist, ventilation engineer, methods engineer, sanitation supervisor, and safety supervisor.

The health committee conducts two meetings a month. The first is a business meeting at which policies and known problems are discussed. The second is usually a factory inspection. On this tour, members of the committee inspect and observe things that have been brought up in previous meetings, or as suggestions or complaints.


KEY
TO LAYOUT
1. Non-grain raising stain spray booth
2. Stain oven
3. Wash-coat spray booth
4. Wash-coat air drying
5. Wash-coat sanding
6. Oil stain spray booth
7. Stain wiping, wool highlighting, and inspection
8. Shade stain spray booth
9. Shade stain oven
10. Stain cooling area
11. Second wool highlight and air dusting
12. Sealer spray booth
13. Sealer oven
14. Sealer cooling
15. Sanding sealer and inspection
16. Varnish spray booth
17. Varnish flow-out
18. Varnish oven
19. Varnish cooling
20. Unloading area for transfer to Plant #2 (for rubbing, packing, and shipping)
21. Empty trays up to 2nd floor
LOADING STATION
3RD FLOOR
2ND FLOOR
1ST FLOOR

HOW FURNITURE, LOADED AT FINISHING OPERATION NO. 1, TRAVELS UP AND DOWN THROUGH THE THREE-STORY BUILDING

CONTINUOUS-FLOW FINISHING

Overhead conveyor provides increased facilities without adding to plant size. And unit cost of final product is reduced

FRANK M. BRANDON • VICE-PRESIDENT IN CHARGE OF MANUFACTURING, CONSIDER H. WILLETT COMPANY, LOUISVILLE

How to step up production of furniture by 50 per cent? That was the problem at Consider H. Willett. Building costs were too high to allow construction of new facilities. Labor and material costs were rising at an alarming rate.

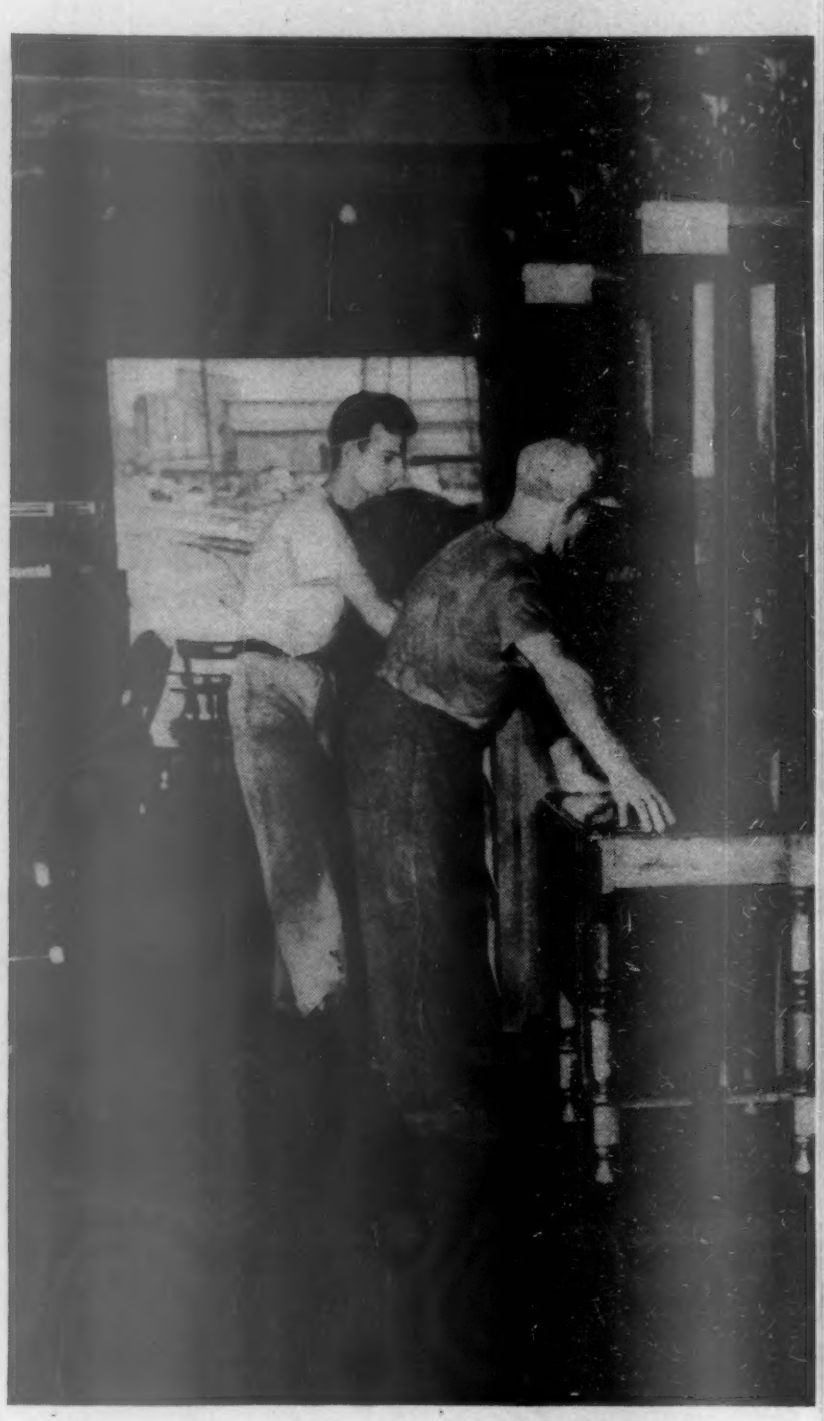
The solution was an overhead conveyor on which all finishing operations are performed. This conveyor has provided the additional facilities required without adding to the plant size, and it has made a material reduction in unit cost of the final product.

One reason for cost reduction is that the number of persons needed for materials handling has been reduced by 50 per cent. Now handling is pretty much confined to loading the conveyor at the start of the finishing line and removing the finished furniture line from the line at the truck dock.

Other advantages of the conveyor system include:

1. Breakage caused by handling has been reduced to practically nothing. This includes scratches and other blemishes on the surface,

LOADING STATION FOR OPERATION NO. 1 (SEE FACING PAGE) . . .



AT THE END OF THE LINE. FURNITURE IS READY FOR SHIPMENT

IN MULTI-STORY BUILDING

which required repair or touching up before release for shipment.

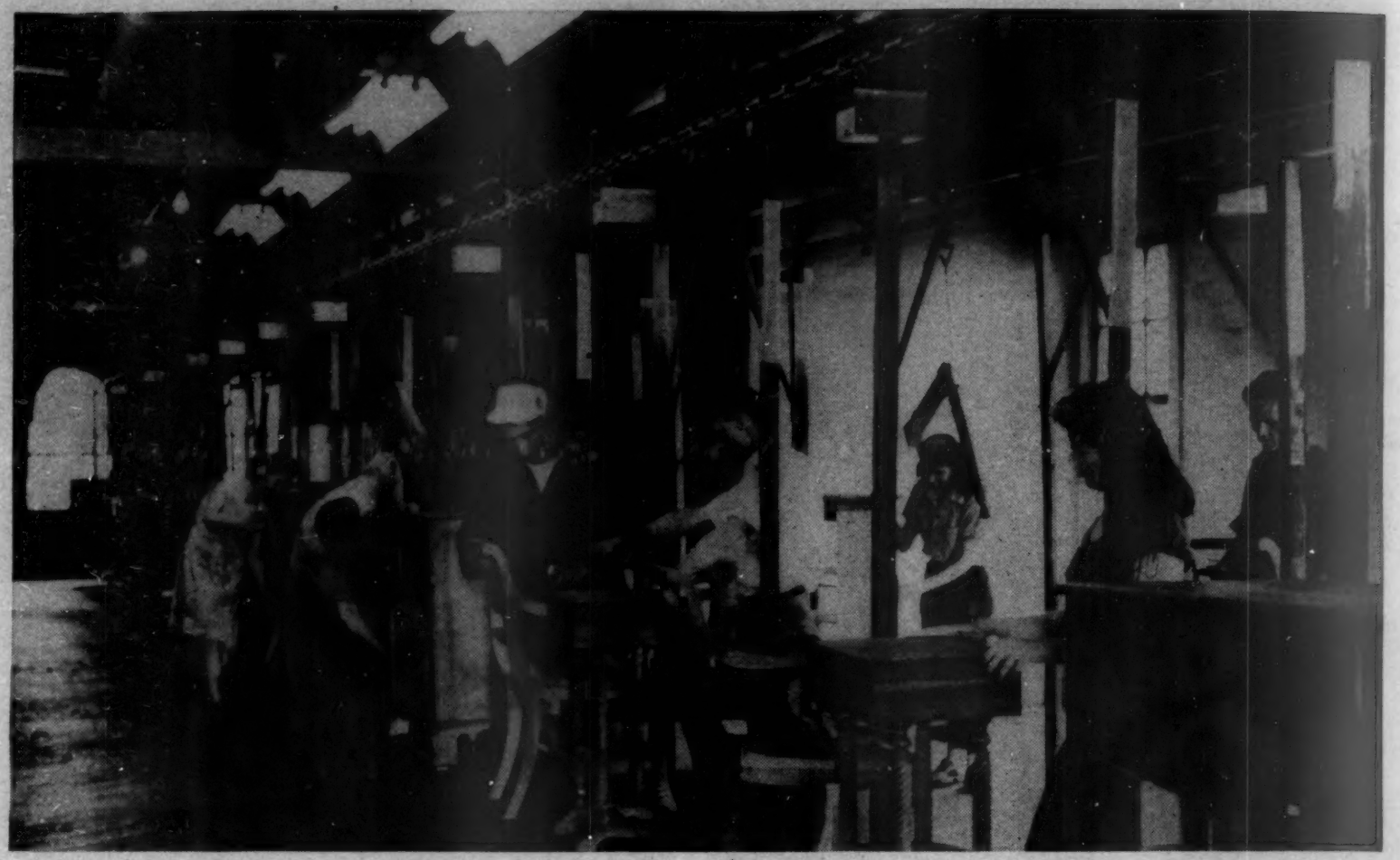
2. Finishing operations called for much lifting and moving of furniture, which has been eliminated.

3. Working conditions have been definitely improved. Confusion caused by the necessity for moving and sorting materials in the various sections of the finishing departments has been done away with.

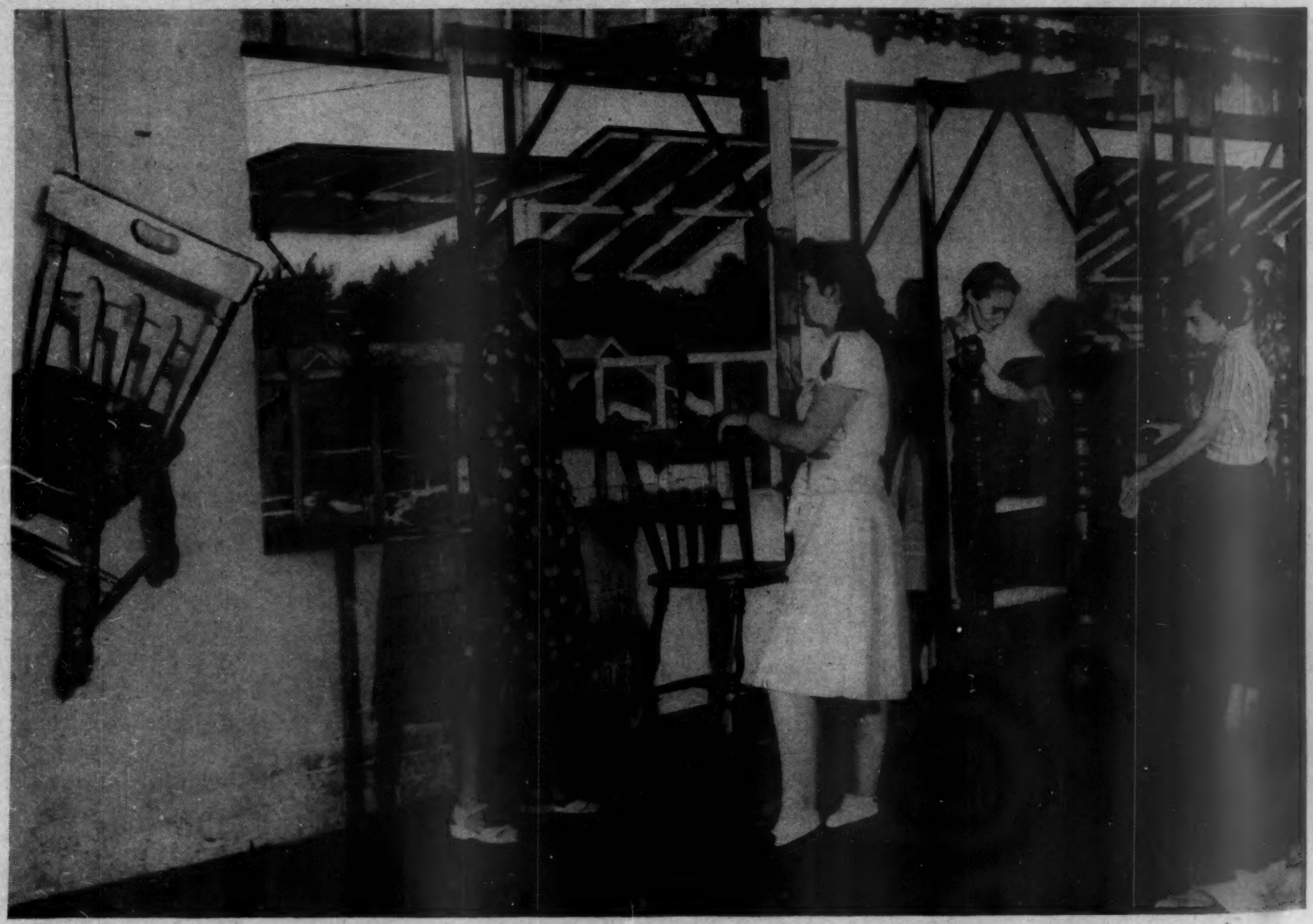
4. Labor turnover has been sharply reduced, because of the elimination of fatigue factors and the improvement in working conditions. It is now less than 1 per cent. It was previously 5 per cent.

The conveyor is 3875 feet long and travels at a rate of 7 feet 2 inches per minute. It takes slightly over 9 hours to complete its course. It carries 436 flat bed trays and 109 hooks. All hooks and carriers are mounted on swivels, which permit them to be completely revolved, thereby exposing all sides of the piece to the operator.

All but two heating furnaces for drying purposes have been eliminated. One staining and two varnishing operations require a drying period at 135 deg. F. after spraying. It was found that the third floor of the building allowed enough space to perform these drying operations while the furniture was on the conveyor. Unit heaters force hot air through heating ducts placed across the third floor. Openings at 2-ft. intervals assure a constant stream of hot air. Another small oven carrying 100 deg. F. is located on the first floor for the drying of sealer.



FLEXIBILITY is a feature of the conveyor used to carry furniture through finishing operations at Consider H. Willett. Carriers on which the pieces ride are mounted on swivels which allow them to be revolved, thereby exposing all sides to the operator

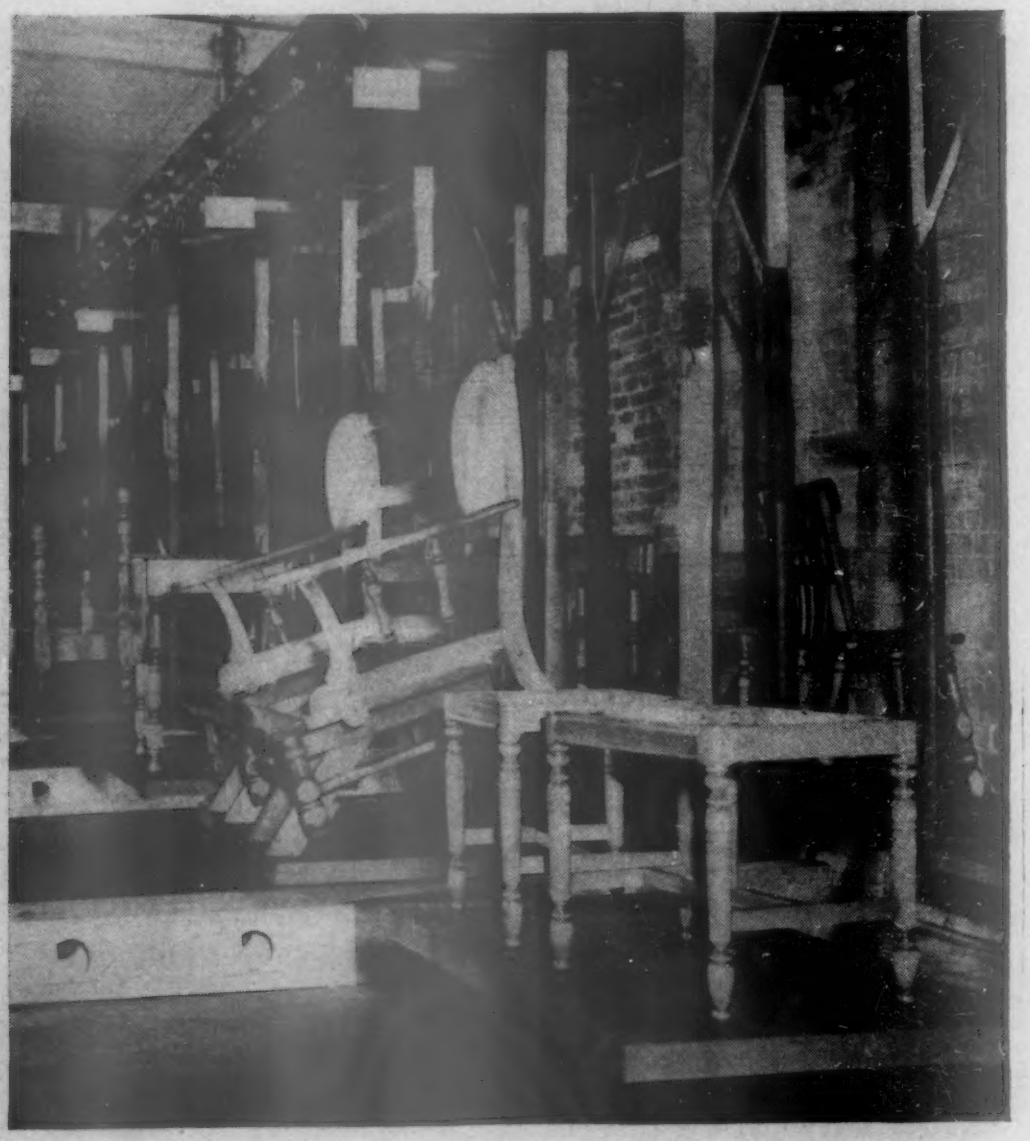


SEALING COATS are sprayed on, then the furniture proceeds through a small sealer oven on the first floor and to the sanding operations shown here. Note how the hook carrier at the far left is used to convey smaller pieces. There is a hook after every

OIL FINISH is sprayed on all furniture in a regulation spray booth. Wiping, inspection, and oven-drying come next

AFTER DRYING pieces are highlighted with steel wool (background). Operator in the foreground is using blower to remove all traces of steel wool dust

fourth flat bed tray. Conveyor is 3875 feet long, takes 9 hours to get around



ENTIRE THIRD FLOOR is used for the drying of furniture after it has been sprayed. Unit heaters force hot air out through ducts along the floor to provide a steady, even temperature

HOW TO MINIMIZE TROUBLE WITH RUBBER CONVEYOR BELTS

What to do, what to avoid, in order to get out of rubber-covered conveyor belts the service they are capable of giving

WALTER P. HALLSTEIN • ASSISTANT MANAGER, BELTING DEPARTMENT, GOODYEAR TIRE & RUBBER COMPANY, AKRON

PREVENTION of trouble with conveyor belts starts before installation. Belts of any substantial length are delivered in circular wooden crates which carry an arrow indicating the direction in which the crate should be rolled. If the crate is rolled in the wrong direction, the belt may unroll itself and burst the crate. Handling thereafter becomes a major operation, and serious damage can result to the belt carcass because of "undesigned for" bending or flexing. In addition, the safety hazard for personnel may be great.

Installation. When installing conveyor belts they should never be sharply folded or creased. An ordinary belt is designed to operate over pulleys 1½ to 4 feet or more in diameter. If the diameters of any folds are less than the diameters of the pulleys over which the belt was designed to operate, the belt may crease and the surface, or outer plies, develop partial fractures. They may be invisible to the eye, but under operating conditions may cause premature failure.

Loading point. Attention must be paid to the design of the loading point. It frequently has to be determined experimentally and adjustments made of the angle, or even the over-all geometry, of the loading chutes, to obtain the best loading conditions.

Ideally, material should be fed to the belt at a uniform rate, as nearly in the direction of the travel and as near the belt speed as possible. This will reduce the wear on the cover to the minimum. Loading conditions may be controlled by:

1. Installing feeders to deposit the load onto the belt more gently than merely allowing it to cascade down a chute.

2. If a chute is needed, designing it so that the load is delivered in the direction of travel and as near as possible at belt speeds. Try to avoid right-angle feed.

3. Putting cushion idlers beneath the belt at the loading point, to reduce impact from large lumps, and lessen the cutting or gouging action.

4. Designing skirt boards to eliminate or reduce the likelihood of material getting underneath them.

5. Making the loading chute approximately two-thirds the width of the belt.

Figure 1 shows damage to a belt from poor loading conditions.

It is often advisable, especially with heavy or abrasive material, to have the load strike the belt midway between two idlers, which permits the elasticity of the belt to cushion the fall of the material. Sometimes it is necessary to remove one idler stand. The material always should have the minimum possible fall.

For most satisfactory performance, it is essential to provide a feeding mechanism that will limit the maximum rate at which the belt can be loaded. A great deal of belt damage can be caused by poor loading conditions. Savings from increased belt life often are much greater than the cost of the proper loading equipment.

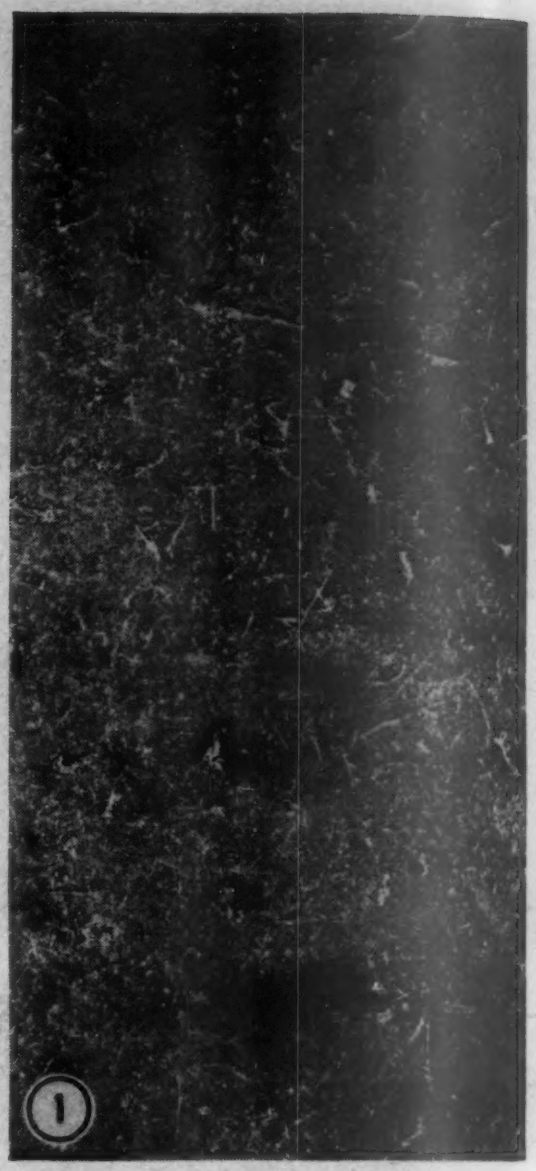
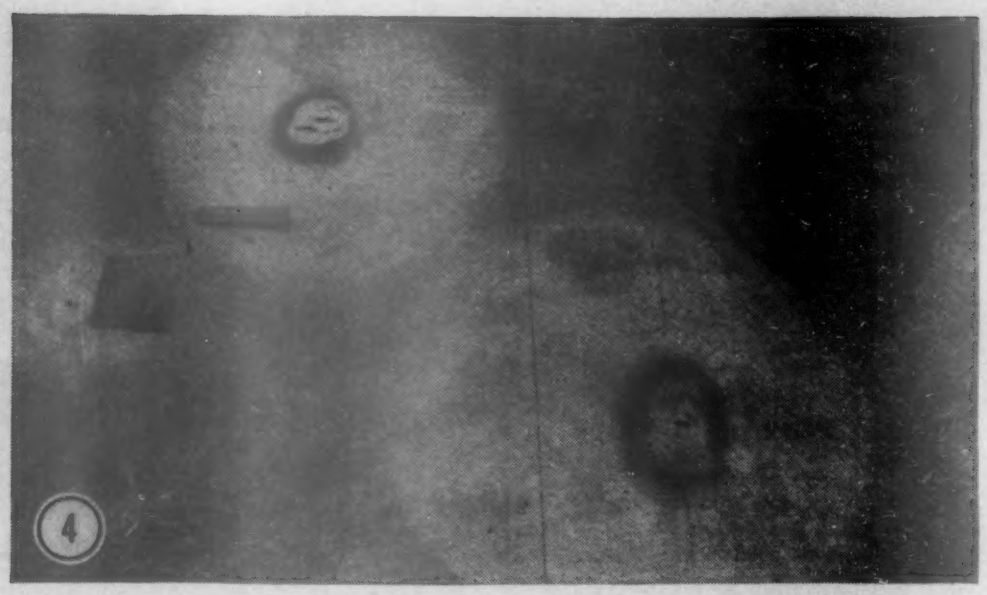


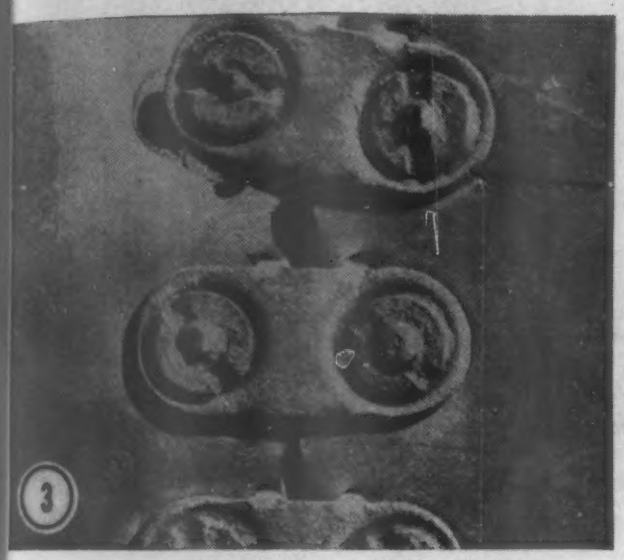
FIGURE 1. This belt was damaged by material striking it at too-high speed—twice that of the belt. . . . **FIGURE 2.** Bottom view

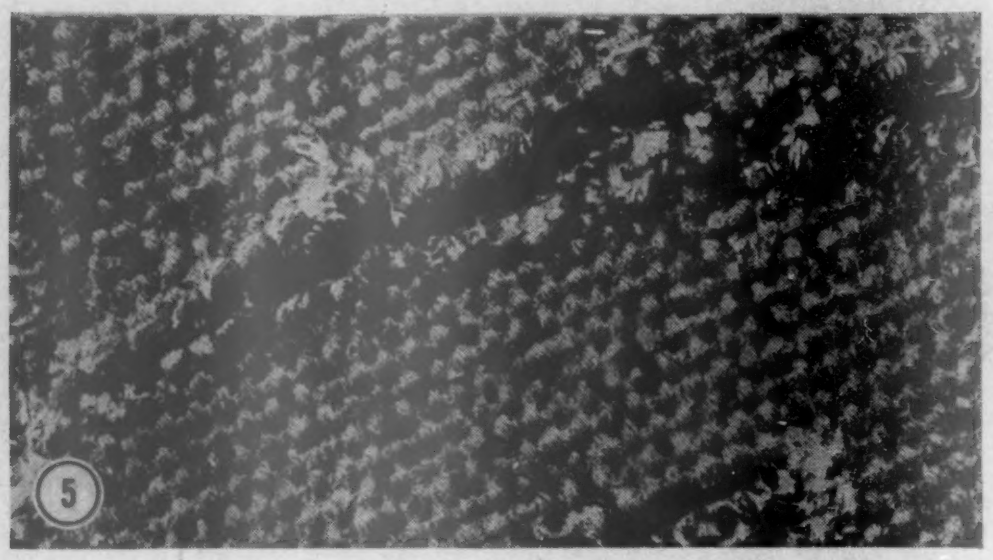
Skirt boards: Skirt boards near the loading point eliminate or reduce the likelihood of material spilling over the edge of the belt. Never put the steel structure of the chute and skirts closer than 2 inches to the surface of the belt. Increase this distance in the direction of travel of the belt, to free any material caught between it and the skirt.

Idlers: Cushion idlers beneath the belt at the loading point (1) reduce impact damage from large lumps; (2) lessen cutting or gouging action; (3) eliminate or reduce likelihood of material getting underneath the skirt boards.

By placing cushion idlers close together at the loading point, it is possible to obtain fairly continuous







of belt fasteners that caused damage because they were not properly tightened when installed, and not retightened afterward. . . . **FIGURE 3** shows the tops of the same fasteners. . . . **FIGURE 4.** White spots show mildew growth. Dark spots are breaks in the duck. (Cover has been stripped from belt.) . . . **FIGURE 5.** Mildew attack caused these breaks in the warp yarns of belt fabric

support of the belt against the skirt board, preventing the belt edges from sagging and allowing material to get underneath.

Material on return run. Usually, it is practically impossible to keep material off the return run of the belt. On the return run it can travel back and get caught between belt and pulley, causing rupture of both the belt surface and the longitudinal or warp yarns. To prevent this, install a plow or scraper on return side near tail pulley.

Carcass life. On most belts the tension is not built up to a point where carcass failure determines the life of the belt. Usually the carcass of a conveyor belt has an inherent life that is much greater than the life of the cover.

Cover life. Belt life usually is cover life. Much of the wear on covers takes place at the loading point. At that point the load is turbulent, and does its scuffing, gouging, and abrading. Once the live load is well past the loading point, it tends to ride along with the belt, and additional belt wear past this point is negligible, except on long-center belts—centers on the order of 1000 feet and over.

No retread. Because of loading conditions or of undulating, to be described later, covers ultimately wear out. It is not economically feasible to retread a conveyor belt. The cost is too large a percentage of the cost of a new belt.

It is not always necessary to replace belts when the covers appear worn. In fact, it is recommended that a belt be run, so long as it will carry the load, until it is ragged. There is little danger of sudden failure under such circumstances. A belt may carry many tons of material after substantial wear starts to show. The lowest belt cost per ton is achieved when a virtually simultaneous failure of cover and carcass occurs.

Remember, however, that the statement, "belt life usually is cover life," holds true only where the cover is of the proper gage and quality for the job. The gage and quality required vary with (1) the number of minutes required for a complete revolution of the belt; (2) types of material carried; (3) various lump sizes.

Selection of carcass and cover quality should be tempered by experience, with the service of belts previously used on the installation being taken into account.

Cleaning. Where there is any tendency of the material to adhere to the belt and be carried around to the return side, it is necessary to install a scraping device to clean

MAXIMUM AND MINIMUM NUMBER OF PLIES FOR TROUGHED BELTS

Belt Width	MINIMUM PLIES TO SUPPORT LOAD											MAXIMUM PLIES FOR TROUGHING			
	LIGHT MATERIALS AS GRAIN OR WOOD CHIPS		FINE COAL, SAND, CRUSHED STONE			FINE ORES, LUMP COAL, LARGE STONE OR GRAVEL				COARSE ORES OR OTHER HEAVY MATERIALS						
In.	28 oz.	32 oz.	28 oz.	32 oz.	36 oz.	28 oz.	32 oz.	36 oz.	42 oz.	32 oz.	36 oz.	42 oz.	28 oz.	32 oz.	36 oz.	42 oz.
12	3	3	4	4		4							4	4		
14	3	3	4	4		5	4						5	4		
16	3	3	4	4		5	4						5	4		
18	4	4	5	4	4	6	5			5			6	5	4	
20	4	4	5	4	4	6	5			5			6	5	5	
24	4	4	5	4	4	6	6	5	5	6	6		7	6	6	6
30	4	4	5	5	5	6	6	5	5	7	6	6	9	8	7	7
36	4	4	5	5	5	7	6	6	5	8	7	6	10	9	8	8
42	4	4	6	5	5	7	7	6	6	8	7	6	11	10	9	9
48	4	4	6	5	5	8	7	7	6	9	8	7	13	12	11	11
54			7	6	6	9	8	7	6	10	9	8	14	13	12	12
60			7	6	6	9	8	7	6	10	9	8	15	14	13	13

The maximum plies for troughing are based on standard three-pulley 20-deg. troughing idlers (or five-pulley idlers with 15- and 30-deg. angles). With special shallow troughing idlers, somewhat thicker belts may be used if tension requires.

the belt. If the material is allowed to build up in large lumps on the pulleys and idlers that come in contact with the carrying side, the belt is subjected to poor training, which is likely to shorten its service.

SHORT BELTS

Cover wear. Many of the factors affecting cover wear in short belts (less than 1000 feet) have been covered in the foregoing. The effects of poor loading conditions are greater on short belts than on long ones, and much more thought must be given to the establishment of good loading conditions.

A matter that is frequently overlooked in determining cover wear on short belts is frequency, or the number of times per minute that a belt passes the loading point. This factor, which affects the rate of cover wear and tear, is practically always fixed by the length of the belt and the speed. To compensate for high frequency, use heavier-gage or higher-quality covers.

To the extent that the majority of conveyor belts wear out in the cover, the cover gage or quality is not the place to pinch pennies when it comes to replacement.

The frequency with which the belt passes the loading point is the most important consideration in selecting cover gage and quality.

Number of plies. Of equal importance to cover gage is the number of plies that must be used to support the load. As may be seen from the table shown above, the number of plies varies with belt width as well as with the type and weight of the material carried. The belt must not only be strong enough to carry the maximum tensions, but it must also be properly proportioned. It must have enough plies to support the load without excessive sag between idlers. On the other hand, it must be flexible enough to trough properly, and bend easily over the pulleys.

If the number of plies needed for tension exceeds the maximum in the last column of the table, it is advisable to change the installation in some way to bring the belt within the limits of this table. Increasing the width, speed, or drive efficiency, or a combination of these elements, will permit the better use of belts. The maximum plies for troughing shown in the table really are *maximum*. As a general rule, it is better to stay below the maximum.

Increased tension. In many instances belts can be operated without slip on the drive pulley at a fraction of the tension capacity of the belt. Frequently, they are operated at such low tension that they sag unduly between the idler stands. Where belt tension capacity is more than required, increasing the tension to reduce sag would result in less wear of the belt cover.

How is one to know whether there is tension capacity to spare? It may be figured by the use of conveyor belt tables; but, to give a general rule, any belt operating on anti-friction idlers—if the belt is horizontal, with no lift—probably will be operating below its tension capacity at any center distance up to 400 feet. If a belt is steeply inclined,

15-18 degrees, it will probably be operating at less than rated tension capacity for any lift up to 40 feet. Up to these limits, under normal circumstances, the minimum ply belt is also adequate for tension requirements of the system. A minimum ply belt is the belt required just to support the weight of the live load, regardless of tension.

Use of higher tensions must be made with caution. High tensions result in additional stretch that may be troublesome. Also, unless pulleys are unusually large, belt plies may separate within the carcass.

LONG BELTS

Cover wear. With long belts (1000- to 5000-ft. sections) the belt passes so infrequently under the loading point, possibly only several times—or even once—an hour, that wear and tear caused by frequency becomes a small percentage of the total wear on the belt. The principal cover wear in such cases comes from the undulation of the belt as it passes the idlers. This causes a slight jostling of the load at each idler stand, producing a motion between the load and the belt surface. While this motion is actually of slight magnitude, on a typical belt conveyor operated on a two-shift basis it is something like 10 million such motions per year.

FASTENERS

Much has been written about fasteners, but troubles traceable to them still develop all too frequently. In Figures 2 and 3, the fasteners were not properly installed; more important, they were not pulled down sufficiently tight. It is essential to make sure that fasteners are pulled down tight initially. Wherever belts are working at high tension and fastener holding strength is important, they should be periodically retightened.

Tests have shown that with fasteners that rely upon compression squeeze of the belt for at least part of the holding strength, the strength will fall off rapidly after initial installation as the rubber tries to work out from under to relieve itself of the squeeze. Measurements have been made on running belts that show a loss of as much as 50 per cent squeeze in the first hour. Usually it will require only about a one-quarter to a three-quarter turn of the nut to restore this squeeze.

After the original retightening, the loss of squeeze pressure is much slower. Retightening the nuts every month or so is often sufficient to retain continuously high fastener pull-out strength. As a general rule it is sufficient, with belts operating at high tension, to retighten the fasteners once after the first hour of operation, once again after the first week, and thereafter every month or so.

Where belts are not working at extreme tensions, this retightening is not so important.

With belts operating at comparatively low tension, it is frequently possible to get by with little or no inspection and maintenance of fasteners. With belts operating at rather high tensions, inspections, retightening, and occasional replacements of fasteners are necessary to avoid shutdowns.

Where belts are operated at extreme tensions, vulcanized splices instead of fasteners always should be employed. Vulcanized splices are stronger and longer lived than any other method of fastening known. They are economical on large installations where there are enough splices to warrant purchasing vulcanizing equipment and instructing a crew of men in making such splices. They greatly simplify the problem of keeping the conveying surface of the belt clean, because scrapers and brushes can be more effectively used.

Properly made splices usually last as long as the belt itself. Even if they require some repairing before the belt is worn out, they have the advantage of not failing suddenly without warning. For this reason vulcanized splices eliminate many of the serious and costly delays that result when metal fasteners are not inspected often enough and are allowed to catch and tear the belt.

MILDEW

Mildew is caused by mold and mildew attack, and results in rotting and deterioration of the load-carrying tension members.

In order to flourish, mildew requires (1) the right degree of moisture (high humidity or belt subject to moisture and wetness); (2) moderate temperature, 60 to 80 deg. F.; (3) darkness (it is always dark inside a belt).

Any belt exposed to outdoor temperatures at certain times of the year is operating in ideal conditions for mildew growth and propagation. A uniform temperature is more conducive to mildew growth than a wide range of temperatures. Attack by mildew usually begins on the first or top ply under a small pinhole opening in the rubber cover. The culture develops on this ply of cotton, and grows concentrically about the point of entrance to dinnerplate size or larger.

Similarly, at most periods of the year the right moisture content is present. Moisture admitted to the cotton carcass through cover abrasions or, over a long period of time, by breathing through the nominally impervious covers, is also a cause of mildew. However, extreme and constant wetness discourages mildew growth.

Moisture absorption into the carcass of the belt often reflects itself in shrinkage of the belt length.

There is no home-made, foolproof approach to avoiding premature belt failure from mildew deterioration. If an installation is subject to mildew, a belt should be used that has a good degree of mildew inhibition. In this respect, it should be noted that even mildew-inhibited belts exhibit considerable variation in increased belt life. Some of the poorest mildew-inhibiting treatments increase belt life by only 10 per cent. On the other hand, with some of the better mildew-inhibited belts, mildew will never be a determining factor in belt life. In fact, the rubber will fail first.

In Figure 4, note the white spot of mildew where deterioration has resulted in nearly 100 per cent loss of duck strength, and small breaks in the duck are beginning to occur. Also note, around the center of advanced rot, the mildew growth spreading itself throughout the rest of the belt.

Figure 5 shows several breaks in the longitudinal warp yarns of the duck in a badly deteriorated spot. These are the load-carrying yarns of the belt.

Load cards provide the basic information . . .

ORDER No. 4760				QUANTITY 500		CHART No. 7J
TITLE ½" STEM				DRAWING No. 435GB2		
OPER.	GROUP	START DATE	ST.	FIN.	LOAD TIME	TOOLS
1	32	8/19			27.8	OK 8/18
2	24	8/24			17.0	
3	30	8/27			4.2	
4	INS	8/28				
5	FINAL					

from which the master load

GROUP	MACHINE
30	2A W&S
	" "
	" "
24	#3 K.S.M.
32	#5 B&O
	" "
33	#2 B&S

and follow-up is recorded

MFG. No.	DESCRIPTION
4761	BONNET
4760	STEM
4762	DISC NUT

THE THREE FORMS ABOVE PROVIDE FULL CONTROL OVER ALL ORDERS IN A SHOP WHERE LONG RUNS OF STANDARD ITEMS . . .

PRODUCTION CONTROL FOR MIXED

One set of simple forms solved the loading, scheduling, dispatching, and control problems in this plant

DOUGLAS HAYNES • CHIEF DISPATCHER, MANNING, MAXWELL & MOORE WATERTOWN, MASS.

SIMULTANEOUS job-shop and mass-production operations posed a tough problem in our plant. It was solved by means of a control system which is not only simple, but which offers sufficient flexibility to have many possible applications.

To see how the system works, it is necessary simply to follow the progress of an order from the time it is sent to production by the sales department. Assume the order is for 500 ½-in. Type A valves.

The first step is to refer to the file of manufacturing orders in the production control office. These orders are grouped by complete items. In other words, if a Type A valve requires 25 parts for complete assembly, these parts are listed as a single group. With the requirements known, the next step is to check against the status or inventory sheet. To simplify the illustration, assume that the only items lacking are 50 bonnets and 500 stems.

The information on parts required is then transmitted to the methods department. Here, the copies of the manufacturer's order are run off on a duplicating machine. Beside the sequence of operation, these forms provide all the information, except

chart is made up to show schedule and projected load by machine groups . . .

MACH. No.	HRS.	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30
121	16													4.2			
302	16																
303	24																
160	24										17						
480	8	PREVIOUSLY LOADED							3.7								
141	24			PREVIOUSLY LOADED									5				
102	16											PREVIOUSLY LOADED					

STEMS (forward scheduling)

BONNETS (backward scheduling)

on the progress chart by crossing out the operations as they are started

QUANTITY	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30
50				OP.1 30								OP.2 32		INS. F.		
500					OP.2 32					OP.2 24			OP.3 30	INS. F.		
100		OP.1 30			OP.2		OP.3		INS.							

. . . AND SHORT RUNS OF SPECIAL ITEMS BUILT TO CUSTOMER SPECIFICATION ARE OF VERY NEARLY EQUAL VOLUME

LONG AND SHORT RUNS

current departmental efficiency, necessary to compute the load time for each operation.

The result of this computation, together with the machine group number for the operation, is transferred to the load card. Black and white prints reproduced from masters in the engineering department files are then stapled to the manufacturing orders, and actual scheduling is ready to begin.

Forward Scheduling. A clerk compares the load card for the parts with the master load chart to ascertain whether or not any group of machines involved in the manufacture of these parts is already heavily loaded. If so, she schedules the parts going on the most heavily loaded machine first. This schedule is projected throughout all its operations to arrive at a finish date from which the other parts (in this case, disk nuts) are scheduled backward. This procedure insures that all parts of a given order will go to finished stores at about the same time, thus controlling finished inventory for both amount and balance.

The load card shows that the first operation must be performed on a machine in group 32, and will require 27.8 hours. Examination of the master load chart shows that the first available time in group 32 is on machine No. 480, beginning on August 19. Operation 1 is therefore scheduled on this machine and will run approximately 3½ days, on one shift. Information is transferred to the master load chart by blocking off the additional time which is now scheduled against machine 480.

Allowing two days for tools to be set up and readied for the start of operation 2, this next job is

scheduled in group 24, for 17 hours on August 24. Following the same procedure on operation 3, the clerk arrives at a finish date of August 27.

Backward Scheduling. It is now necessary to schedule the bonnets, which are required for final delivery on August 28. Reference to the bonnet load card would show that the operation previous to final is No. 2 on group 32, requiring 29 hours. For delivery on August 28, this operation should be completed on August 27. The master load chart shows that time is available on machine No. 141 on August 26 and 27, and the operation is so scheduled. Allowing two full days for tool kit preparation, August 23 becomes the latest possible finish date for operation 1. The master load chart, however, shows that machine 102, the only one in group 33, which is required for operation 1, has already been loaded for other work on August 22 and 23. Thus, it is necessary to schedule the operation for a finish date on August 21. Since 64 hours are required, and the machines are available for 16 hours per day, this means a starting date of August 18.

With the actual mechanics of scheduling now completed, a clerk fills in the starting dates of all operations on the load card. On a progress chart, the clerk lists all manufacturing numbers for parts covered by a given order. Against these numbers is shown the starting date for each operation. The load cards are now filed in a "Jobs to Come" section, and the progress chart is filed with all active progress charts.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 138) . . . a summary of **LABOR DEVELOPMENTS** (page 216) . . . things **YOU WANT TO KNOW** more about (page 206)

When the material arrives on the manufacturing floor, the corresponding load cards are pulled from the "Jobs to Come" file and refiled in the "Jobs Waiting" section. The load cards are filed by starting date required; that is, oldest dates first, in the group in which the first operation is to be done.

The earliest starting date in the example chosen is August 18. On August 17, the dispatcher draws the load card out of the "Jobs Waiting" section and refiles it in the "In for Tools" section. Simultaneously, the print is sent to the tool crib, where the necessary tool kit is prepared.

"O.K." From Tool Crib

On receipt of an "O.K." slip from the tool crib, the dispatcher withdraws the load card, marks tools "O.K." against operation 1, and refiles the card in the "Jobs Waiting" section, according to the machine group required for the operation.

When an operator working in group 33 appears at the dispatch window for his next job on August 18, the dispatcher will insert a checkmark opposite operation 1 on the load card and hand the operator the "O.K." slip. The operator takes this slip to the tool crib and receives the necessary kit.

On completion of operation 1, the operator returns the print to dispatching. A clerk gives the operator his next "O.K." slip and then inserts a checkmark under "Finish," opposite operation 1. The load card is then refiled in the "Jobs Waiting" section, where it is ready to repeat the cycle for the second operation.

To insure that prearranged schedules are followed, or that the necessary rescheduling is undertaken when this is impossible, a daily progress report is made up. This report lists the manufacturing number, operation number, number of the progress chart (which covers all manufacturing numbers incident to a given order), load time for the operation, and the machine group number performing the operation.

Information in this report is used as a basis for drawing process lines on the progress chart. The lines are entered on the day the operation is begun, and extend to the subsequent operation. When all jobs started during the day have been recorded on the progress chart in this manner, a clerk lists all the manufacturing numbers on which operations scheduled to start that date were not begun.

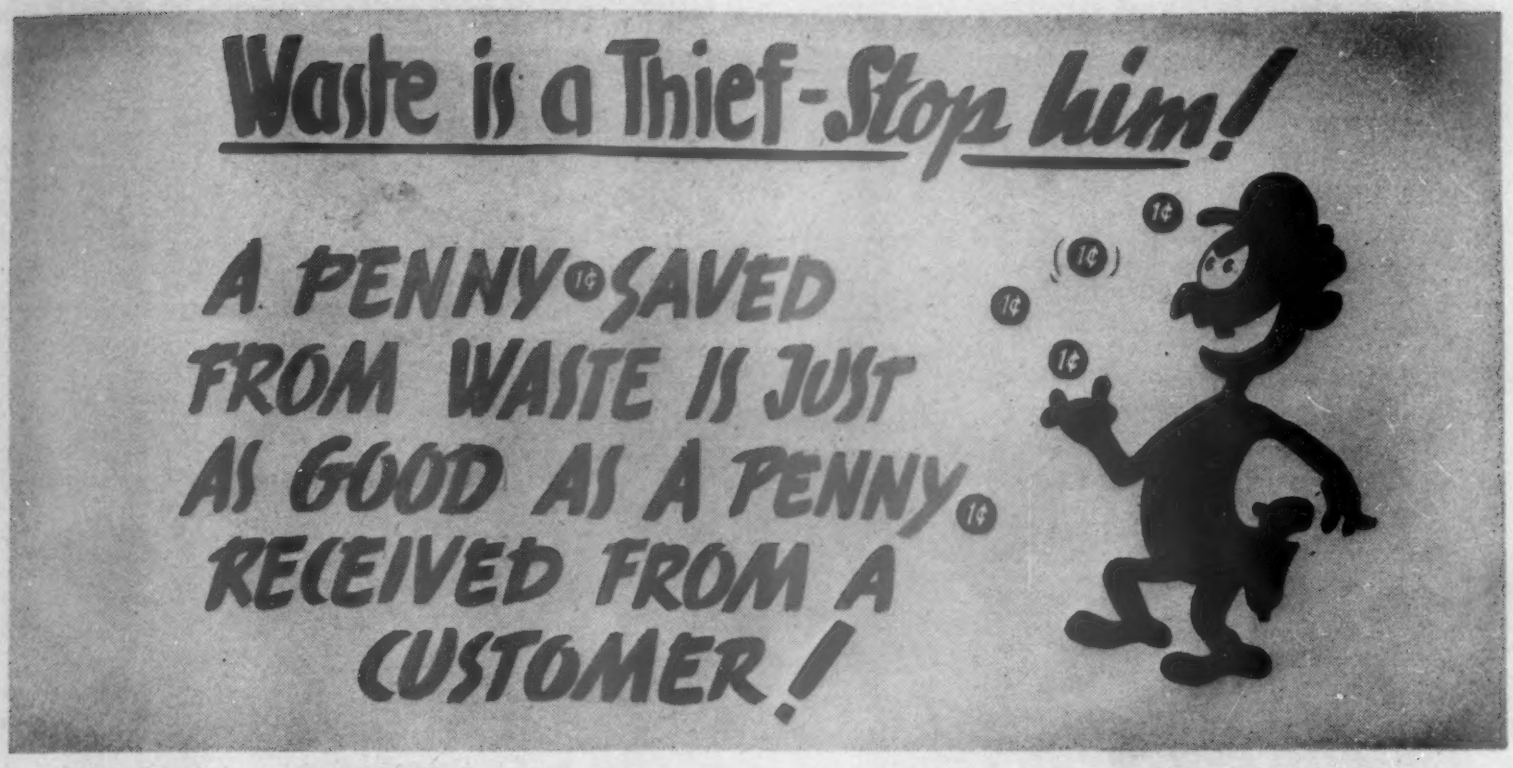
The scheduling clerk then collects the load card from whichever of the four dispatching files it happens to be in, and reschedules all jobs on which work is not up to date. The first step in this process, of course, is to deduct from the master load chart whatever time had been previously scheduled for these jobs. After this has been done, the rescheduling operation proceeds in exactly the same manner in which the original scheduling was performed. Once the new schedule is set, the load card and progress chart are altered to show the correct starting date for each operation.

Each time a clerk reschedules the job, she notifies the production specialist involved of the finish date on the new schedule. If this date proves unsatisfactory, dispatching is notified. The dispatcher makes an effort through the use of overtime, additional running time, or permission from the methods department to change the machine grouping to meet the original or a satisfactory date. If remedial steps are not within the province of the dispatcher, the matter is referred to the superintendent. If all of these attempts fail to produce the job, the sales department is notified.

A System That Works

The system described is basically sound in theory, and in actual practice works efficiently. However, a production control system in a departmentalized manufacturing scheme must cease to be a system and become a company policy.

This is not accomplished by an overnight miracle. It requires education regarding the job to be done, combined with periodic recognition of those who have contributed outstanding efficiency. Toward this end, the various supervisors in the plant meet weekly to discuss machine loading, allocation of manpower, over-all production policies, and jobs-out-on-time performance. The object of all these meetings is to instill the entire manufacturing division with the desire to *meet the date.*



"A PENNY SAVED IS A PENNY EARNED"—THAT WAS THE ACTIVATING THOUGHT BEHIND VOIT'S WASTE-SAVING CAMPAIGN

POSTERS AND PENNIES LAUNCH $100,000 WASTE CAMPAIGN

Within three weeks, employees submitted suggestions for waste reduction with potential savings of $100,000 a year

C. E. LAUTERBACH • MANUFACTURING RESEARCH, W. J. VOIT RUBBER CORPORATION, LOS ANGELES

ONE morning, as Voit employees arrived at their workplaces, they began finding pennies.

There were pennies in the parts trays, in drawers, under tools, on window sills, under tables, on the floor. There were literally thousands of pennies. Of course, they were picked up. Everybody was picking up pennies.

But where did they come from? Foremen were answering honestly when they said they didn't know.

Actually, nobody did know—except the committee on waste. On Sunday afternoon, when the factory was closed, members of this committee had hidden 5000 pennies throughout the plant.

The "secret" was let out the following day. Each employee received a letter from the company president, W. D. Voit. He explained that the pennies were "planted" around the factory to emphasize the fact that waste lying about the factory represents pennies—and in some cases dimes and dollars. He put it this way:

"Has it ever occurred to you that a valve core lying on the floor is a penny? That an end patch is two pennies? That a section of ball fabric is four pennies? Probably not, because these values were not represented in coin of the realm."

The pennies in the plant brought the point home, and the waste control campaign was launched with a high degree of interest.

To insure continued interest, a uniform slogan was adopted for use on posters and campaign literature:

"Waste Is a Thief! Stop Him!"

The effect was further increased by a visual association. A goblin-type character was identified as "Waste, the thief." His likeness appeared on all the posters.

Some of these placards were on the monitory type, gave a gentle (and usually humorous) hint as to how waste might be eliminated. Here is an example:

"It shure won't make
"Nobody sore—
"If you pick those pegs up
"Off the floor."

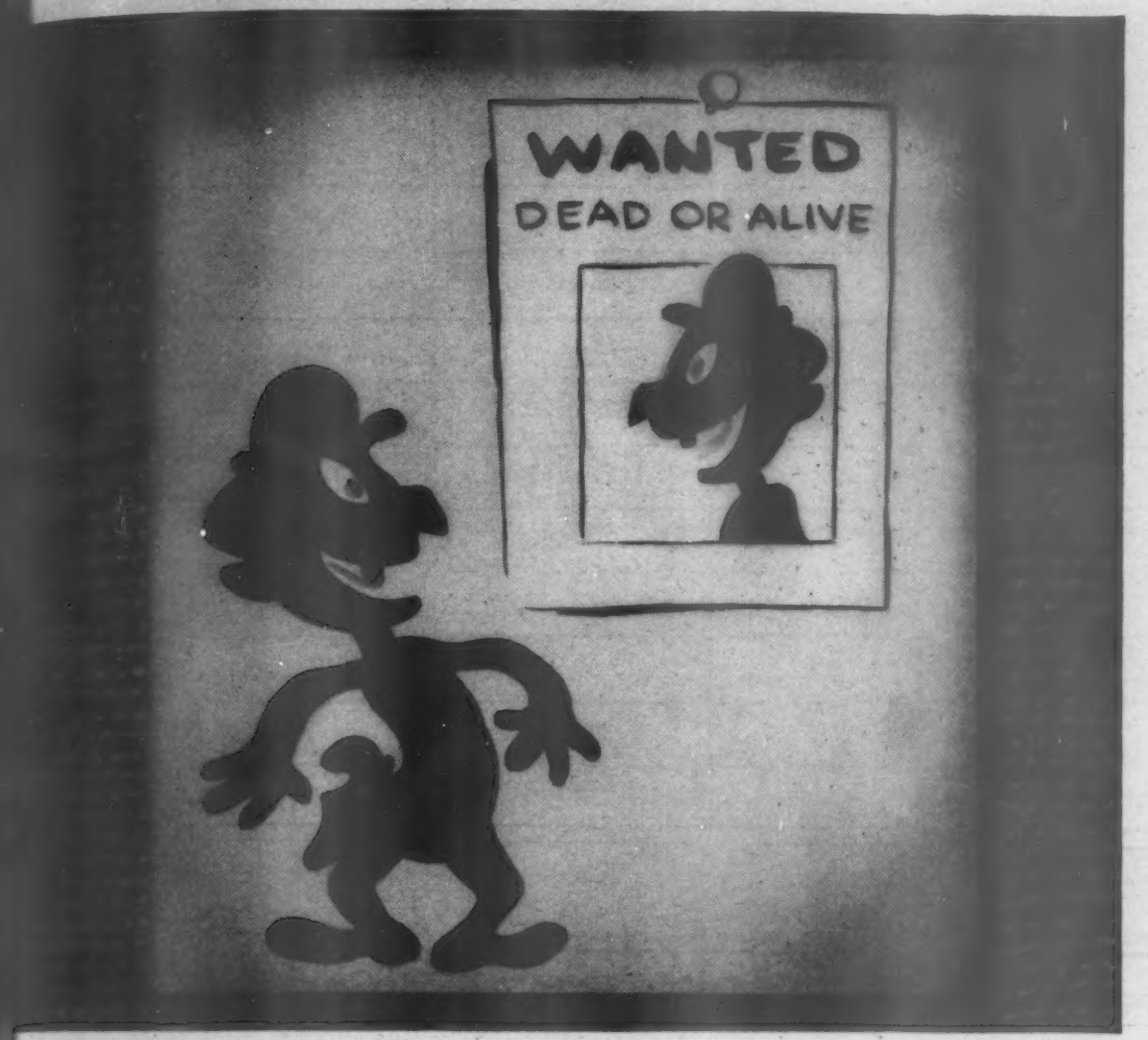
Other placards were of the informative type, presented facts about the cost of items which frequently find their way into the scrap pile. If possible, the part was mounted right on the poster. This helped to emphasize the fact parts as small as valve stems represent a dollar each. Where necessary, miniatures were used.

Simultaneously with the announcement of the waste campaign, an appeal was made for waste-saving suggestions. Prizes were

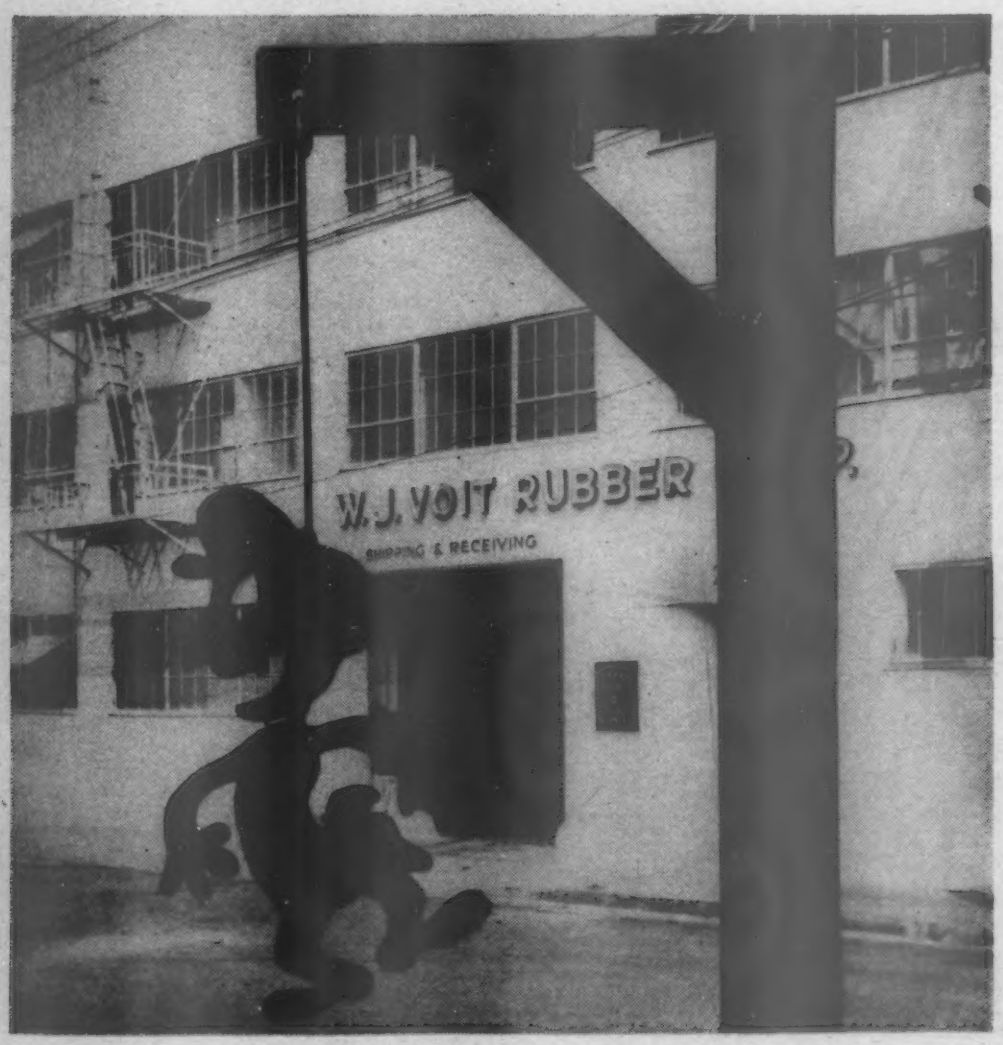
Posters that backed up the Voit Rubber Company's campaign against waste...

Principal message of each poster was a hint on where to find the thief...

...all carried caricatures of "the thief" himself



...and bring him to a well deserved end



offered for the 14 best suggestions submitted in each of three weekly contests. The awards ranged from automatic pencils to $25 in cash. An additional award of $5 was made each week to the employee submitting the best four-line jingle or limerick for use on the waste campaign posters.

The result was 171 suggestions for improvements with a potential value of over $100,000 in savings. It is probable that the full potential will never be realized. Some of the "savings" made have been overestimated in the preliminary analysis. As planning progresses toward installation, others may prove to be impractical. But every suggestion received careful consideration, and many have already been installed:

1. An idea for a break-away roller at an inspection machine (total installation cost $36.04) cut inspection time by 55 per cent, for an annual net saving of $1876.46.

2. Simple adjustment of a machine on which stock is cut reduced excess trim by 2½ inches, resulted in an annual saving of $3650.

3. A new idea for repairing blemished balls (instead of automatically grading them down) is saving approximately $2100 a year.

4. Improvement of a workplace layout in the soft-ball department has reduced the loss of kapok, with savings of $690 a year.

5. The method of washing and filtering used alcohol solutions after cleaning valve housings has been improved, reducing annually the cost of the operation over $500.

Following the intensive waste campaign, immediate steps were taken to organize a permanent suggestion system.

To prevent any misconception on the part of employees that the job was done when the waste campaign ended, the company pulled no punches in presenting this not-too-happy fact about the financial condition of one of its major departments: "The sport ball just about pays overhead, and that's all."

Employees were already suggestion conscious. With the prospect of awards that might run as high as $2500, they seem likely to remain so. Results so far have been good.

One Plant Fire Out of Five Is an Electrical Fire*

SOURCES OF ELECTRICAL FIRES	Number of Claims	Per Cent of All Claims	Amount of Fire Damage	Per Cent of Fire Damage
WIRING	1132	5.5	$2,045,423	8.5
MOTORS	998	4.9	568,231	2.4
TRANSFORMERS	65	0.3	378,466	1.6
SWITCHES AND CONTROLLERS	724	3.5	291,528	1.2
LAMPS AND ELEMENTS	439	2.1	231,798	1.0
GENERATORS	49	0.2	106,003	0.4
FUSES	99	0.5	27,413	0.1
INSTRUMENTS	9	0.1	1,142	0.0
MISCELLANEOUS	394	1.9	322,172	1.3
TOTAL	3909	19.0	$3,972,176	16.5

*Figures shown here are for the period, 1940-46

WHERE ELECTRICAL FIRES START IN INDUSTRIAL PLANTS

There is little or no excuse for many of the fires of electrical origin in industrial plants. Careful inspection and good maintenance would prevent them

C. F. HEDLUND • ELECTRICAL ENGINEER, ASSOCIATED FACTORY MUTUAL FIRE INSURANCE COMPANIES, BOSTON

DEFECTIVE electrical equipment is by far the predominating cause of all industrial fires. This fact is clearly shown by the loss experience of the Associated Factory Mutual Fire Insurance Companies for the seven-year period from 1940 to 1946 inclusive. Specifically, the records show that fires of electrical origin accounted for 19 per cent of all claims and 16.5 per cent of all fire damage. Losses caused by electrical fires approached $4,000,000 during this period.

How the different classes of electrical apparatus rate from the standpoint of fire hazard is shown above.

WIRING From the table it will be seen that defective wiring heads the list of electrical fire causes. This is not surprising, in view of the extensive use of wiring systems of all types and ages, and under every conceivable condition. Depending upon the nature of the occupancy and the location, wiring systems are exposed to excessive heat, cold, vibration, moisture, corrosion, oil, abrasion. In many ways they are severely abused, and often overloaded. Maintenance may be inadequate or entirely lacking.

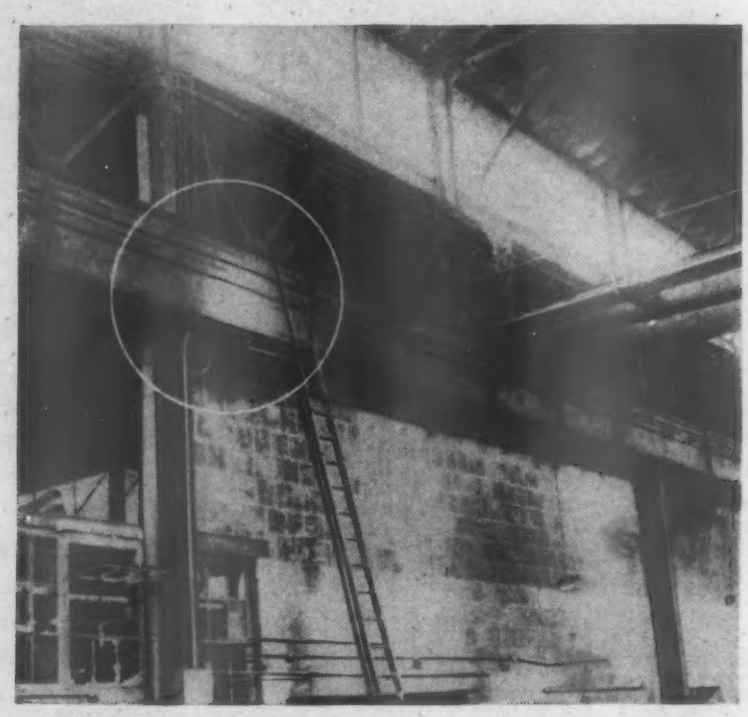
Aside from these and other factors that contribute to insulation failure, there is plain, ordinary old age to contend with. The two principal enemies of insulation are time and temperature. Continued severe overloading of circuits or equipment with consequent overheating will eventually cause them to fail, long before they would normally have broken down.

Fires from defective wiring frequently result in severe damage. In a midwest steel plant, a short circuit occurred in some oil-soaked, open knob-and-tube wiring on the basement ceiling of a main building. Oil dripping from machinery on the first floor had soaked the floor and the wiring below. This, com-

bined with severe vibration from the machines, contributed to insulation failure. The building in which the fire started, a two-story and basement structure with brick walls and joisted roof and floors, was destroyed along with most of an adjoining one-story and basement building. Three other buildings were severely damaged. The loss amounted to $262,000.

A similar loss occurred recently at another midwest metal-working plant. It amounted to about $250,000 in property damage and $75,000 in loss of production. A short circuit apparently occurred in a 440-volt single-phase circuit which extended from open overhead lines under the roof downward in rigid conduit to a 40-kva., 440/110-volt, single-phase, oil-insulated transformer.

The arc seems to have occurred close to the point of entrance to the fitting on the end of the conduit. Oily deposits on the building column supporting the conduit were ignited. The fire quickly spread to an oily crane girder and thence over the underside of the asphalt-coated metal roof. Burning asphalt dropped down on combustible enclosures, bins, and racks, and onto oily deposits on and around automatic screw



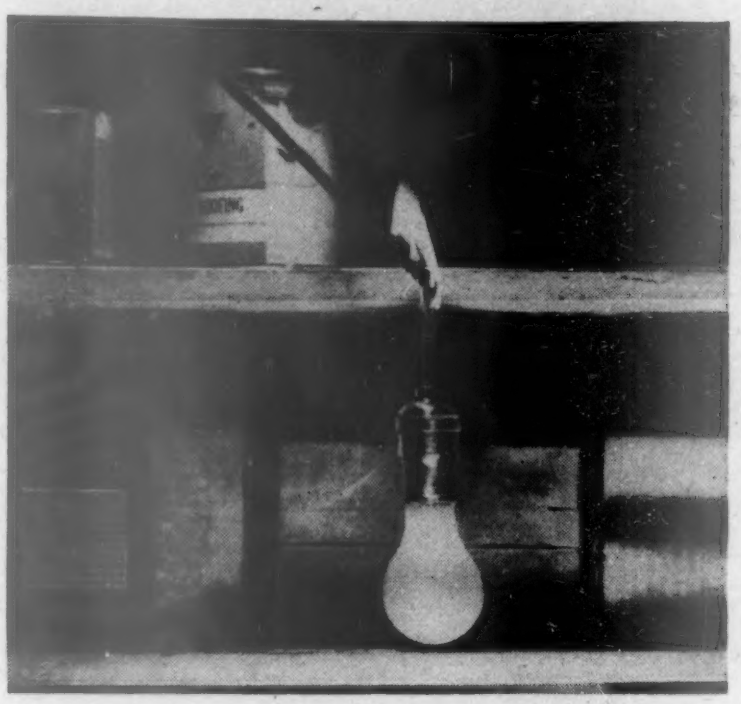
WHITE SPOT ON GIRDER SHOWS WHERE ARCING TOOK PLACE

machines. The asphalt-coated roof and walls of the building were severely damaged, along with the machinery and goods in process.

A common wiring failure occurs in the drop cords of pendent lamps. When a pendent light does not hang just where wanted, it is common practice to hang it on a nail or hook, or tie it in place with a piece of wire. In time the insulation on the cord chafes through where it bears on the support, and a short circuit occurs.

In the textile industry it is essential that pendent lamps be well maintained at all times, because a small spark nearly always means a fire where combustible lint or fibers are present. Many large losses occur in jacquard weave rooms, caused by ignition of the highly combustible loom harness from defective lamp cords. This happened several times in one plant in Pennsylvania, with individual losses amounting to as much as $16,000.

For such occupancies pendent drop cords are not safe and should be replaced with pipe-pendent lighting fixtures or ceiling fixtures.



A NAIL OR HOOK SUPPORTING LAMP CORD WILL CUT INSULATION

Another hazard in wiring installations that is frequently overlooked, even on new installations, arises from the practice of grouping many important conductors having combustible insulation in a junction box, pullbox, cableway, trench, or manhole. A fire starting in one circuit from the arc of a short circuit or ground may easily involve all other conductors within the enclosure. Many such fires occur every year, sometimes with disastrous results.

To safeguard against this hazard wrap the individual conductors in the enclosure with asbestos tape applied with a 50 per cent lap. Then paint the wrapping with a solution of silicate of soda.

It is common practice to cover the high-voltage cables in manholes with asbestos cement applied over a layer of especially prepared felt.

MOTORS

Fires due to motor troubles are second on the list of electrical fire causes. They occur nearly as often as those caused by wiring defects.

Causes of motor fires are: (1) Single-phasing due to poor contacts in motor controllers or a blown fuse in a three-phase supply circuit; (2) puncture of insulation by lightning; (3) winding failures caused by dirt, oil, moisture, old age, or mechanical damage; (4) overheating of amortisseur winding in synchronous motors caused by loss of d.c. field excitation; (5) worn bearings; (6) improper application; (7) motor not properly aligned; (8) excessive vibration; (9) short circuits in leads because insulation is worn or oil-soaked; (10) overloading and lack of proper overload protection; (11) sparks from commutator-type motors.

A fire in a festoon dryer for drying flock print goods probably originated at a poor connection in the leads to the fan motor of a steam unit heater in an enclosure attached to the side of the dryer. The dryer, which

was constructed of gypsum board on wood studding, was extensively damaged and about 12,000 yards of flock print curtain stock in the dryer was destroyed. The fire opened many sprinklers and a considerable amount of semi-finished and finished curtains, draperies, and printed cloth in the two stories below was damaged by water leaking through the floors. The damage was estimated at between $75,000 and $100,000 and production was interrupted for five days.

TRANSFORMERS

Transformer fires, although rather infrequent, are third in the list in respect to the amount of loss sustained. This indicates that a transformer is a relatively reliable and safe device, but when it is located without due regard to the potential oil fire hazards involved, a heavy loss can result if failure occurs and large quantities of the insulating oil are liberated from the tank and ignited.

Transformer failures occur most frequently from (1) lightning; (2) bushing failures; (3) loose leads grounding on the tank and burning a hole in it so that oil escapes and ignites; (4) internal short circuits resulting from insulation failures between turns or from phase to ground; (5) loose internal connections; (6) loss of insulating oil due to leakage; (7) overheating.

The hazard of locating large oil-insulated transformers in the same room with important or valuable equipment is illustrated by the loss that occurred at a large western plant. A short circuit occurred in a single-phase 333-kva., oil-insulated, 13,200/440-volt transformer. The energy involved in the arcing that followed was sufficient to split a welded seam in the tank from cover to base and release about 255 gallons of oil.

The main switchboard and other transformers in the same room were damaged by the ensuing fire, but by effective firefighting the damage was kept to a loss of about $8000. Temporary repairs were completed and service was restored within 24 hours, but the transformer in which the failure originated was destroyed, primary and secondary bushings on an adjoining transformer of the same size were disintegrated by the heat, the cover gasket was burned, and fuses, disconnecting switches, and insulators were destroyed. Windows were cracked and walls and equipment throughout the substation were heavily coated with an oily soot that had to be cleaned from all insulators and high-voltage apparatus before power could be restored.

Fortunately the transformer that failed had been operating at only about 30 per cent of rating so that the oil released into the room was relatively cool and did not ignite. The fire was confined principally to the oil remaining on the windings, and the coil insulation. Had the oil on the floor become ignited the main switchboard would have been destroyed and the other contents of the room severely damaged.

Important switchboards or switchgear should not be installed in the same room with large, oil-insulated transformers. Where it is necessary to place them in the same area, transformers of the non-flammable liquid or dry type should be provided.

A DEFECTIVE CONTROLLER CAN THROW PLENTY OF HOT SPARKS

SWITCHES AND CONTROLLERS

Switches and controllers are fourth on the list as far as the amount of resulting fire damage is concerned, but third with respect to the number of fires they cause. These fires are caused by (1) loose connections at terminals, causing overheating and arcing; (2) loose parts causing short circuits or grounds; (3) excessive arcing because of burned contacts or low or dirty oil in switches, circuit breakers, and starting compensators; (4) short circuits caused by leakage of water, oil, or conducting dusts into switch enclosures; (5) improper application, such as the use of ordinary switches in hazardous locations, instead of explosion-proof or dust-tight types; (6) inadequate interrupting capacity; (7) unprotected openings, such as poorly fitting and damaged covers, and missing knockouts in switch enclosures; (8) severe vibration causing loose connections; (9) worn insulation.

In the picker room of a southern cotton mill a short circuit caused violent arcing in a controller, blew open the cover, and threw sparks a distance of 20 feet. Cotton laps were ignited and fire flashed over about 300 of them, causing a loss of some $1500. Seven sprinklers operated and extinguished the fire, preventing further damage.

Defects in controllers, along with ineffective latches that do not hold the covers securely closed, are all contributing factors to such fire losses.

In a plant manufacturing electrical machinery a double-throw, oil-insulated starting switch with overload coils was used with an auto-transformer to control a 150-hp. motor that drove a condenser pump for a turbine. Washers on the operating rod of the oil switch that were designed to limit the travel of the moving contacts either had broken off or worn off so

that the contact was permitted to drop and touch the metal pan.

The resulting arc fused a hole in the pan and the oil in the switch leaked out and was ignited. Fire spread to combustible insulation on leads above the starter and to conductors that passed through the ventilating air duct of a 6000-kva., 2300-volt turbo-generator. Fire was drawn through the duct and into the generator windings. The switch and its wiring were damaged beyond repair and the generator stator windings and laminations had to be replaced. The loss was estimated at between $15,000 and $20,000.

Periodic inspections of the oil switch might have prevented this loss. Built-in fire protective equipment for the generator, such as water spray pipes inside the end shields or an automatic carbon dioxide system, would have confined the damage in the generator to the stator coils.

LAMPS AND ELEMENTS

Unguarded incandescent lamps are a serious hazard in textile mills, or in any area where combustible fibers such as cotton hemp and sisal or other easily ignitable materials are stored. Hot filaments or the sparks that accompany the breaking of a lamp can easily ignite such materials.

Lamps often are brogen by being accidentally struck, or by vibration. On rare occasions they explode for no apparent reason. Sometimes material is carelessly stacked so that a pendent lamp is in contact with it.

To prevent such fires, locate pendent lamps in the middle of the aisles and arrange them so that they cannot hang on racks or against goods stacked in piles. Also, provide substantial guards over the lamps.

In cotton storage areas, opener and picker rooms, and card rooms in cotton mills, lamps should be enclosed in a substantial glass globe to confine the sparks and hot filaments. Use of pendent cord lighting fixtures preferably should be discontinued in these areas. Fixed ceiling units or pipe pendents are to be preferred because they are safer.

Extension lamps that are not thoroughly guarded are a similar hazard. In a cotton mill in South Carolina an employee working on a jacquard plush loom dropped an extension light, and, although it was equipped with a wire guard, a projecting setscrew broke the lamp and the hot filament ignited lint under the loom. The ensuing fire burned off the warps and it was necessary to redraw the jacquard pattern. The loss amounted to $1500, including lost production.

Had the lamp been enclosed with a vaporproof globe this loss would have been prevented.

LAMP BULBS BECOME HOT ENOUGH TO IGNITE PAPER OR CLOTH

FUSES

Fuses are more of a fire hazard than is commonly appreciated if they are not properly maintained, safely located, and suitably enclosed. At an eastern paper mill a renewable fuse of the cartridge type rated at 600 amperes, which provided branch circuit protection for a large 440-volt synchronous motor, recently had blown several times in as many days. It was refilled with extra links totaling 800 amperes. This fuse was on the front of an old-fashioned, live-front ebony asbestos switchboard. Eleven other three-phase circuits were fed from the same switchboard. Each was controlled and protected by a three-pole disconnecting switch and cartridge fuses that were located on the front of the board.

The casing of the 600-amp. fuse apparently had been weakened by the repeated blowings, and when it operated again the case ruptured. The arc spread to the fuses and fuse contacts of the other two phases and a severe three-phase short circuit resulted. The main secondary circuit breaker, which was supposed to be the back-up protection under such circumstances, failed to open because the overload relays did not operate. As a result, the sustained arcing spread to the bare fuse contacts or the knife blade switch of the adjoining circuit. Then the arcing, probably aided by ionized air, spread progressively from one set of switches and fuses to the others over the entire face of the switchboard. Combustible insulation on the feeders leaving the switchboard also was ignited and fire burned back along the conductors into the conduits.

At about the same time the current caused by the short circuit apparently was so heavy that it caused a secondary bushing on the supplying power transformer to break down and arc to ground. This fault continued until the primary feeder breaker at the power company's substation was opened manually about 15 minutes later by a member of the emergency crew, thus interrupting electric power supply to the plant.

The arcing had by this time destroyed the switchboard and fire had burned back along the feeder cables for a short distance into each steel conduit. The total loss, including loss of production, was about $20,000.

Had the overloaded condition of the circuit in which the trouble originated been relieved, or the fuses protecting the circuit been properly maintained, this loss never would have happened. Also, if the overload relays for the main secondary circuit breaker had been properly maintained the damage might have been confined to the circuit in which the trouble originated.

This loss also showed the need for non-combustible insulation for wiring at switchboards. Where feeders are grouped at these points they should be safeguarded by covering each conductor with an asbestos sleeve or a wrapping of asbestos tape, as previously described.

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SWITCHES AND CONTROLLERS

Switches and controllers are fourth on the list as far as the amount of resulting fire damage is concerned, but third with respect to the number of fires they cause. These fires are caused by (1) loose connections at terminals, causing overheating and arcing; (2) loose parts causing short circuits or grounds; (3) excessive arcing because of burned contacts or low or dirty oil in switches, circuit breakers, and starting compensators; (4) short circuits caused by leakage of water, oil, or conducting dusts into switch enclosures; (5) improper application, such as the use of ordinary switches in hazardous locations, instead of explosion-proof or dust-tight types; (6) inadequate interrupting capacity; (7) unprotected openings, such as poorly fitting and damaged covers, and missing knockouts in switch enclosures; (8) severe vibration causing loose connections; (9) worn insulation.

In the picker room of a southern cotton mill a short circuit caused violent arcing in a controller, blew open the cover, and threw sparks a distance of 20 feet. Cotton laps were ignited and fire flashed over about 300 of them, causing a loss of some $1500. Seven sprinklers operated and extinguished the fire, preventing further damage.

Defects in controllers, along with ineffective latches that do not hold the covers securely closed, are all contributing factors to such fire losses.

In a plant manufacturing electrical machinery a double-throw, oil-insulated starting switch with overload coils was used with an auto-transformer to control a 150-hp. motor that drove a condenser pump for a turbine. Washers on the operating rod of the oil switch that were designed to limit the travel of the moving contacts either had broken off or worn off so

that the contact was permitted to drop and touch the metal pan.

The resulting arc fused a hole in the pan and the oil in the switch leaked out and was ignited. Fire spread to combustible insulation on leads above the starter and to conductors that passed through the ventilating air duct of a 6000-kva., 2300-volt turbo-generator. Fire was drawn through the duct and into the generator windings. The switch and its wiring were damaged beyond repair and the generator stator windings and laminations had to be replaced. The loss was estimated at between $15,000 and $20,000.

Periodic inspections of the oil switch might have prevented this loss. Built-in fire protective equipment for the generator, such as water spray pipes inside the end shields or an automatic carbon dioxide system, would have confined the damage in the generator to the stator coils.

LAMPS AND ELEMENTS

Unguarded incandescent lamps are a serious hazard in textile mills, or in any area where combustible fibers such as cotton hemp and sisal or other easily ignitable materials are stored. Hot filaments or the sparks that accompany the breaking of a lamp can easily ignite such materials.

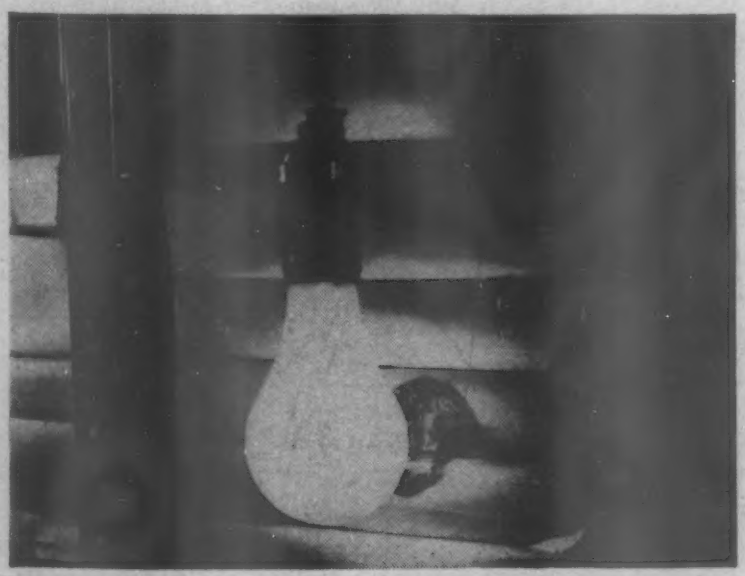
Lamps often are brogen by being accidentally struck, or by vibration. On rare occasions they explode for no apparent reason. Sometimes material is carelessly stacked so that a pendent lamp is in contact with it.

To prevent such fires, locate pendent lamps in the middle of the aisles and arrange them so that they cannot hang on racks or against goods stacked in piles. Also, provide substantial guards over the lamps.

In cotton storage areas, opener and picker rooms, and card rooms in cotton mills, lamps should be enclosed in a substantial glass globe to confine the sparks and hot filaments. Use of pendent cord lighting fixtures preferably should be discontinued in these areas. Fixed ceiling units or pipe pendents are to be preferred because they are safer.

Extension lamps that are not thoroughly guarded are a similar hazard. In a cotton mill in South Carolina an employee working on a jacquard plush loom dropped an extension light, and, although it was equipped with a wire guard, a projecting setscrew broke the lamp and the hot filament ignited lint under the loom. The ensuing fire burned off the warps and it was necessary to redraw the jacquard pattern. The loss amounted to $1500, including lost production.

Had the lamp been enclosed with a vaporproof globe this loss would have been prevented.



LAMP BULBS BECOME HOT ENOUGH TO IGNITE PAPER OR CLOTH

FUSES

Fuses are more of a fire hazard than is commonly appreciated if they are not properly maintained, safely located, and suitably enclosed. At an eastern paper mill a renewable fuse of the cartridge type rated at 600 amperes, which provided branch circuit protection for a large 440-volt synchronous motor, recently had blown several times in as many days. It was refilled with extra links totaling 800 amperes. This fuse was on the front of an old-fashioned, live-front ebony asbestos switchboard. Eleven other three-phase circuits were fed from the same switchboard. Each was controlled and protected by a three-pole disconnecting switch and cartridge fuses that were located on the front of the board.

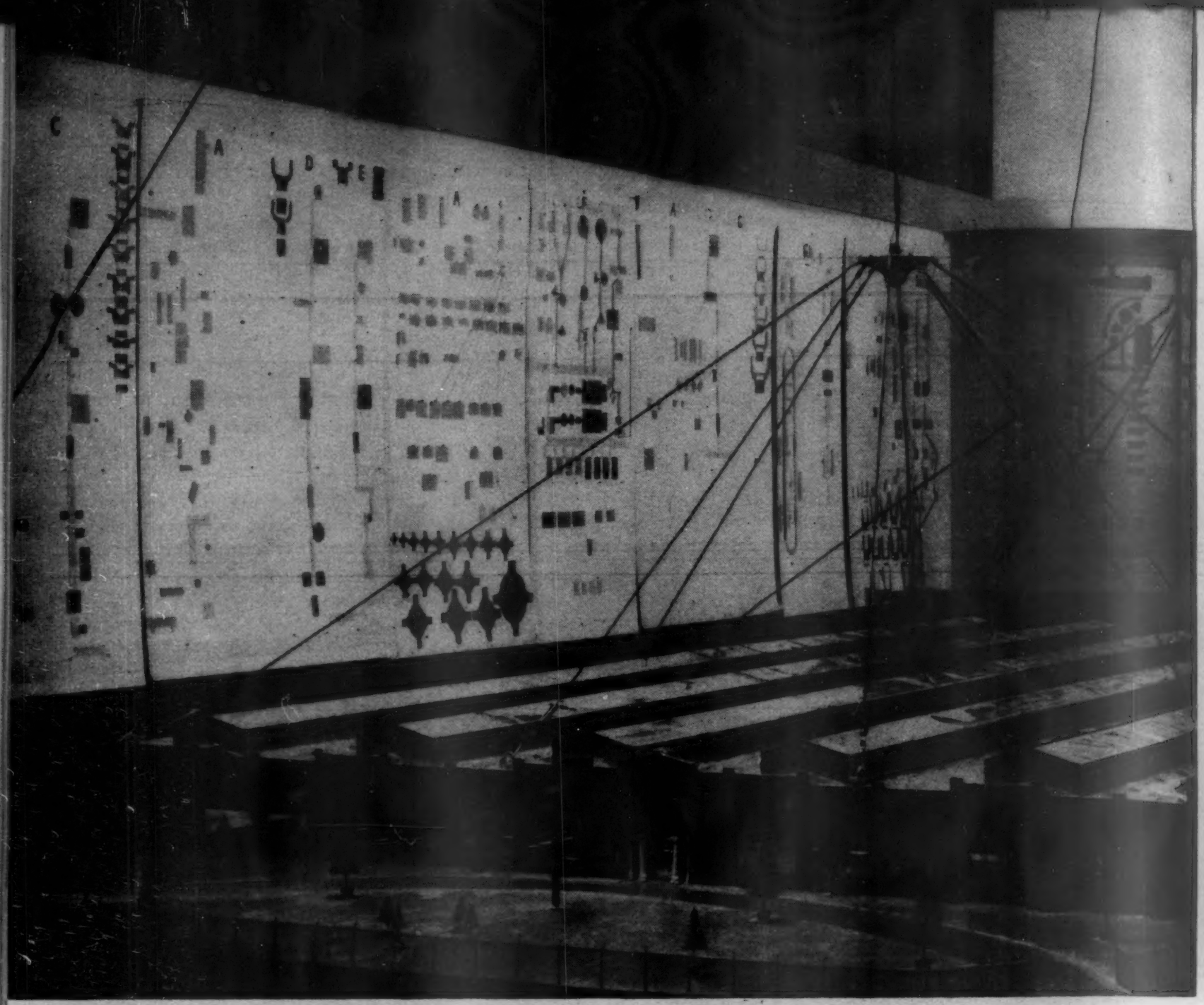
The casing of the 600-amp. fuse apparently had been weakened by the repeated blowings, and when it operated again the case ruptured. The arc spread to the fuses and fuse contacts of the other two phases and a severe three-phase short circuit resulted. The main secondary circuit breaker, which was supposed to be the back-up protection under such circumstances, failed to open because the overload relays did not operate. As a result, the sustained arcing spread to the bare fuse contacts or the knife blade switch of the adjoining circuit. Then the arcing, probably aided by ionized air, spread progressively from one set of switches and fuses to the others over the entire face of the switchboard. Combustible insulation on the feeders leaving the switchboard also was ignited and fire burned back along the conductors into the conduits.

At about the same time the current caused by the short circuit apparently was so heavy that it caused a secondary bushing on the supplying power transformer to break down and arc to ground. This fault continued until the primary feeder breaker at the power company's substation was opened manually about 15 minutes later by a member of the emergency crew, thus interrupting electric power supply to the plant.

The arcing had by this time destroyed the switchboard and fire had burned back along the feeder cables for a short distance into each steel conduit. The total loss, including loss of production, was about $20,000.

Had the overloaded condition of the circuit in which the trouble originated been relieved, or the fuses protecting the circuit been properly maintained, this loss never would have happened. Also, if the overload relays for the main secondary circuit breaker had been properly maintained the damage might have been confined to the circuit in which the trouble originated.

This loss also showed the need for non-combustible insulation for wiring at switchboards. Where feeders are grouped at these points they should be safeguarded by covering each conductor with an asbestos sleeve or a wrapping of asbestos tape, as previously described.



ROOF ON THE PLANT MODEL, WHICH ACTS AS A DUST COVER, CAN BE REMOVED BY PULLEY AND CABLE. TEMPLET LAYOUTS . . .

USING A COMBINATION OF METHODS

No more mind's eye visualization of layout changes. Models show just where everything will be, how it will work

G. C. GRIDLEY • PRESIDENT, MECHANICS UNIVERSAL JOINT DIVISION BORG-WARNER CORPORATION, ROCKFORD, ILL.

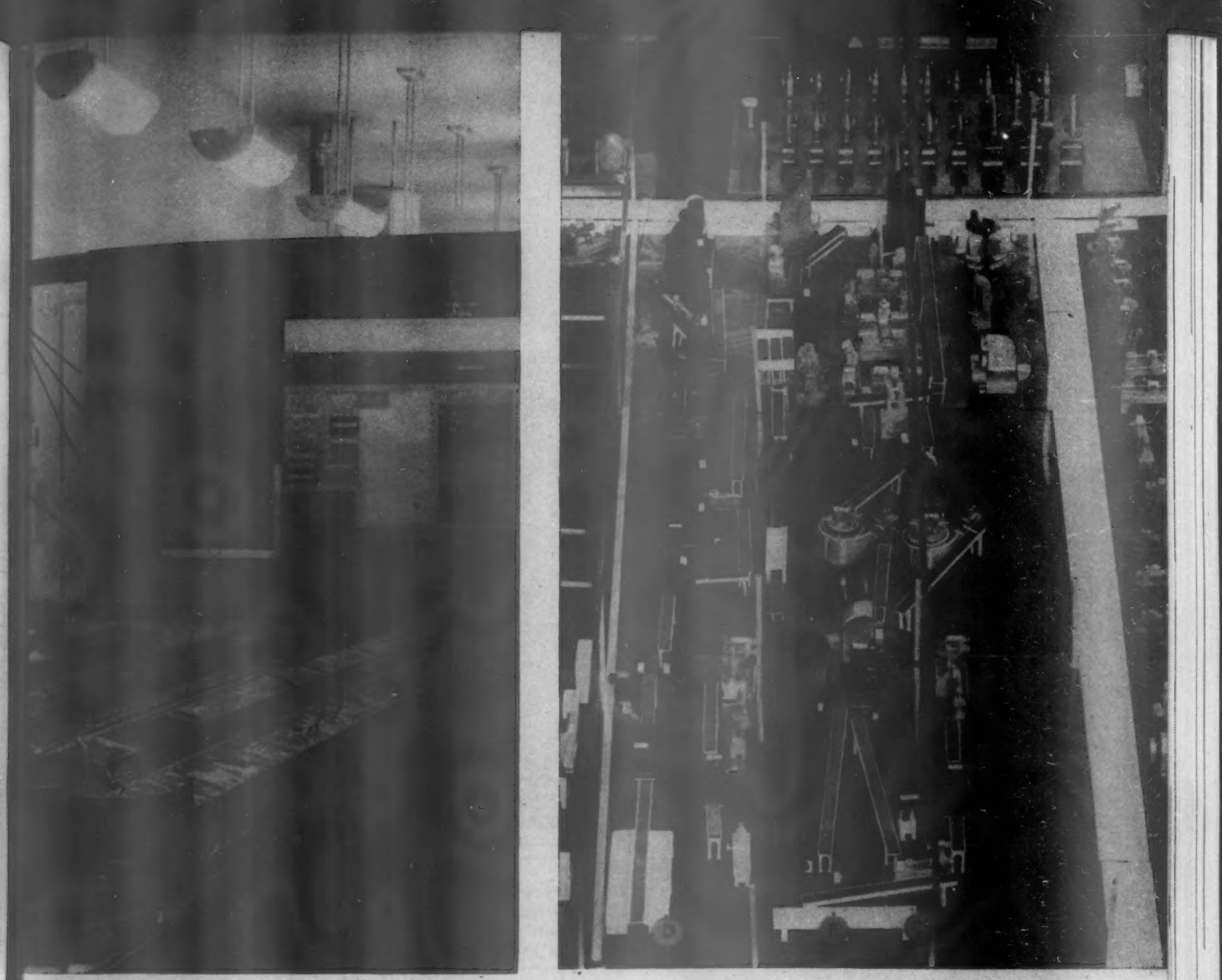
PLANT layouts and models are doing a real job for production and maintenance men, as well as top management, at Mechanics Universal Joint Division. They make it easy for everyone to see what is going on, and why. And by allowing careful pre-planning, they help lower costs, improve methods, build a better product.

Four types of layouts are used: (1) A rough plot and building shell; (2) machine and equipment templets; (3) department area layouts; (4) a three-dimensional detail model of the exterior and interior of the plant.

1. **Rough plot and building shell** is made almost entirely of plywood. Its primary purpose is to give everyone a quick picture of the plant and grounds. It is used to plan expansion of plant facilities and exterior improvements. The model board is 4x9 feet; the scale, ⅛ inch equals 1 foot. It is suspended on one side of the layout room, and can be raised or lowered at will.

2. **Templet layouts,** made of each department, are on bristol board. Paper templets are tacked or stapled in position. Colored string represents flow of materials from stock centers to the various operations.

3. **Area diagrams** are made of all departments to determine the relationship between them, as well as the over-all materials flow lines. These diagrams consist chiefly of colored paper templets, cut to scale, showing the department's size. They



. . . ON WALL DEPICT DEPARTMENTS AND AREAS. PICTURE AT RIGHT SHOWS DETAILED MODELS OF MACHINERY AND EQUIPMENT

TO GET EFFECTIVE LAYOUT

are placed in the shell outline of the plant to indicate how the various departments fit and function together. Layout engineers use these area layouts to simplify location of the departments before making the model layout.

4. A three-dimensional model of the plant, complete with all the details included from the three previous steps. Replicas are made of the smallest office item to the largest machine in the factory. The board is 9x20 feet, and the scale, ¼ inch equals 1 foot.

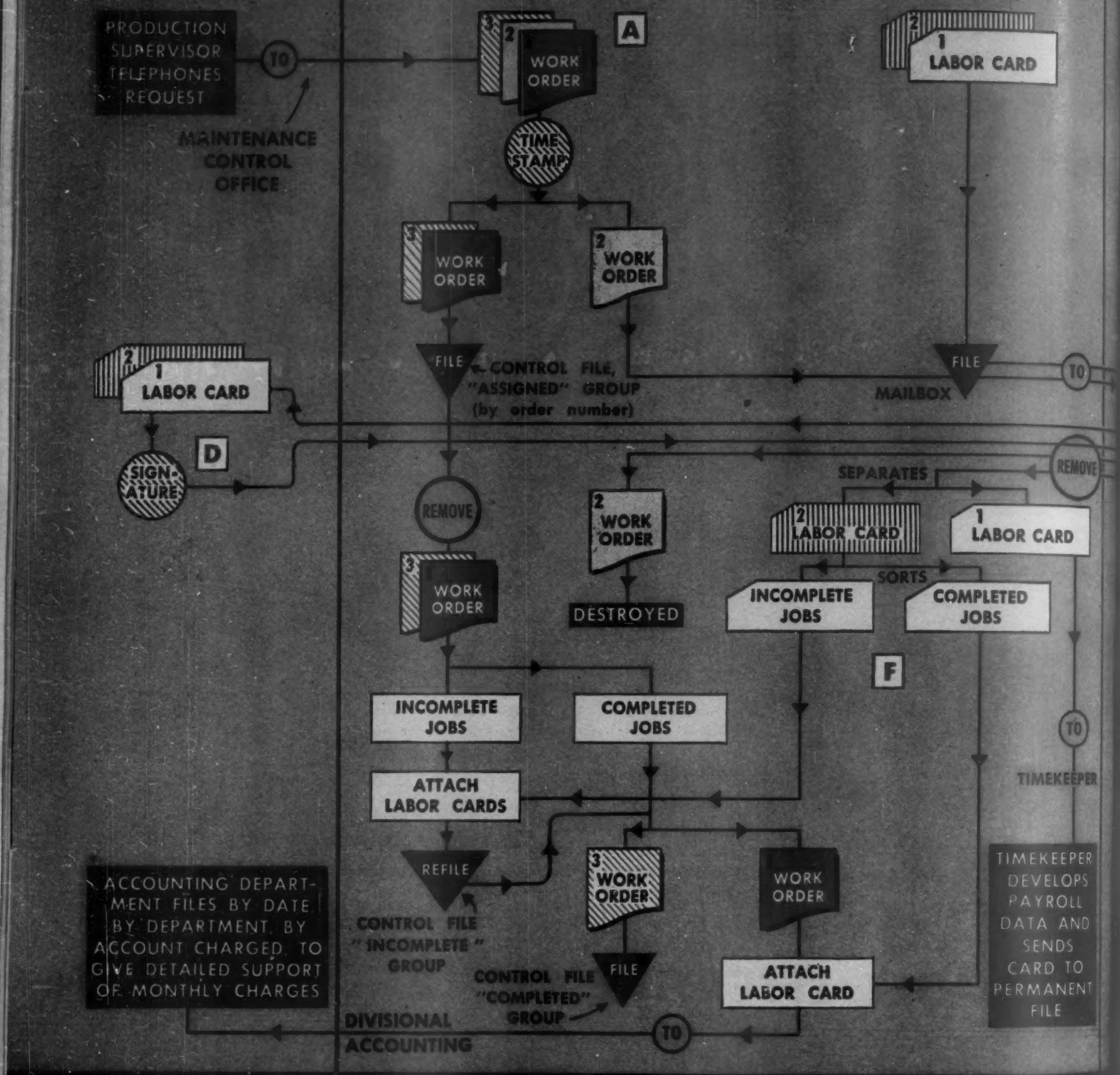
With this model, production, maintenance, and management men can get together and thresh out all their problems. No longer is it necessary for these men to walk around the plant and try to visualize how and where machines will be placed. They can arrange and re-arrange until they find the one best way, merely by lifting machines and equipment with their fingers.

Many materials are used in the model's construction. It has a plywood base with a hard surface. Colored sawdust represents grass in front. Miniature trees depict plantings. One-quarter-inch steel rod is used for columns and overhead braces. Stock cribs are made of wire screening, departmental mats are of celluloid. Wood is used for machine models, plywood for office partitions, plastic for floors of overhead washrooms, and so forth.

Color is used extensively to simplify understanding of the model. Red is new equipment; blue, old equipment; pink, benches and conveyors; yellow, aisleways; dark green, cribs, lockers, and washrooms. Numbers identify departments; letters, production lines.

Machines and equipment models are glued to celluloid mats. The mats can then be moved around as plant changes occur.

An exact replica of the plant roof acts as a dust cover for the model, and it gives it a lifelike appearance. It can be raised or lowered by an overhead pulley and cable.

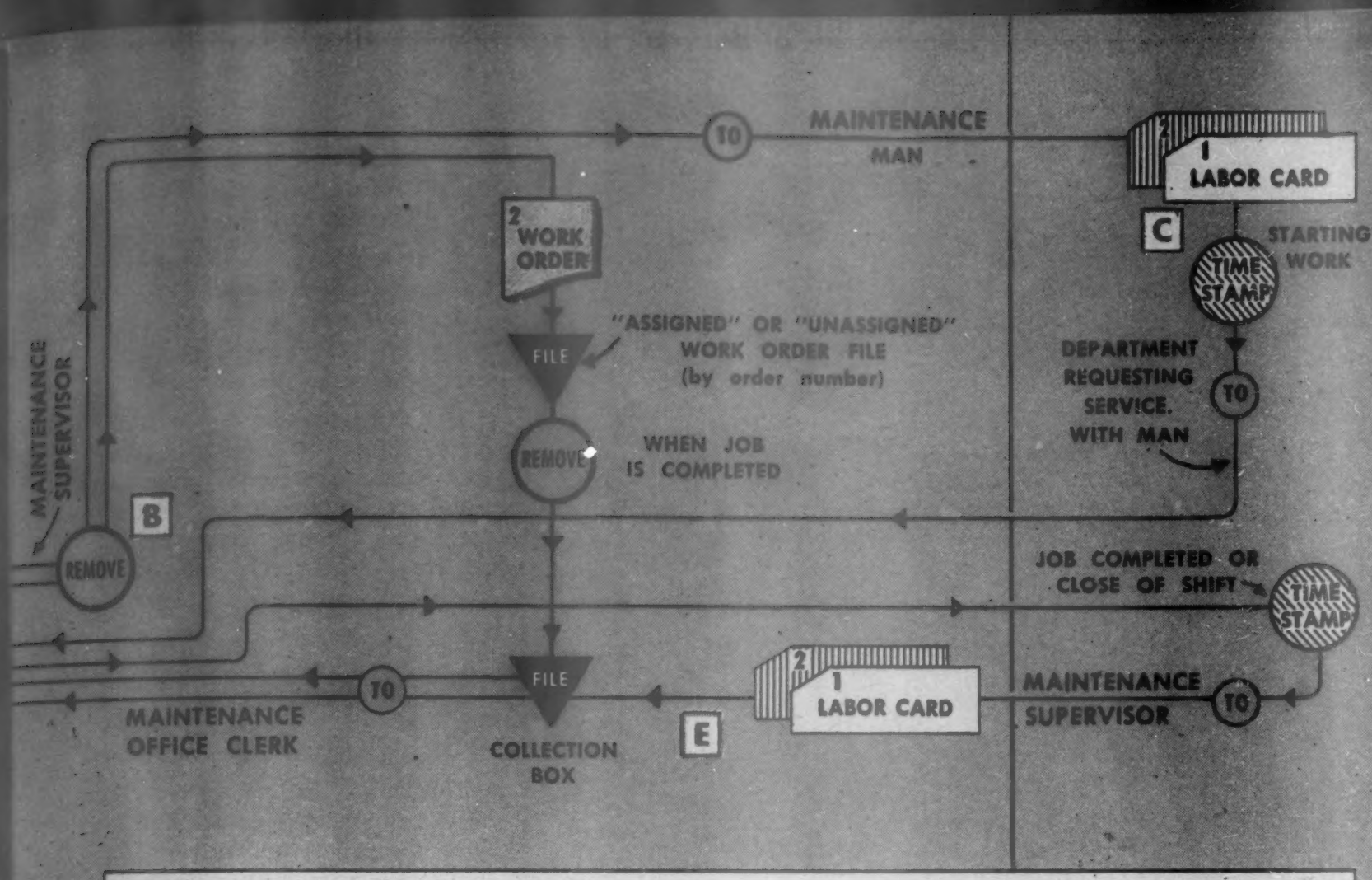


NEW SYSTEM SLICES 10 PER CENT

W. S. JOHNSTON • INDUSTRIAL ENGINEER, VALVE & JET PROPULSION DIVISION TAPCO PLANT, THOMPSON PRODUCTS INC., CLEVELAND

Two pocket-sized forms, carefully designed to fit all phases of maintenance work. A plan of routing these forms with the flow of work so they can always be accounted for. These features are the sum and substance of a new maintenance work-order system recently installed at Tapco, which is saving 10 per cent of its maintenance labor costs. And this is a saving that cannot be dismissed as mere pin money, because the annual maintenance labor budget is in excess of a million dollars.

Numerous other advantages are stemming from the system's opera-



DESCRIPTION OF FLOW CHART

A Maintenance clerks make out a work order in triplicate, also one "trailer" labor card in duplicate. Work orders are time-stamped, and the second copy and the set of trailers are placed in the mailbox

B Maintenance supervisor removes orders and trailer cards from the mailbox, schedules work in order of numerical sequence (emergency jobs get priority), and assigns jobs to his men. Separate trailers are made out for each extra man on the job

C Maintenance man enters timekeeping data on trailer, time stamps it when starting job, and carries it with him until completion of job or end of shift

D After completion of job, maintenance man gets approval signature of production supervisor on set of trailers. Then he time stamps trailers and returns set to his supervisor. If job is not completed by end of shift, he time stamps trailers and returns them to his supervisor

E Maintenance supervisor checks all trailers for accuracy and completeness. He checkmarks one of the two blocks to show stage of completion and signs. He then deposits all trailers (complete and incomplete), and copy of completed work order, in the collection box

F At the end of each shift, the maintenance clerk empties the collection box. Time on all trailers is posted to the two copies (using carbon) of work orders found in the "assigned" control file. One copy of trailer is sent daily to timekeeping department, which reports labor charges to the accounting department. The other trailer copy is attached to the two copies of the work order held in the "assigned" control file, which are then removed and refiled in the "incompleted" control file. Here the incompleted orders and trailers are accumulated until supervisor's "completed" copy of work order arrives. Completed orders are then sorted and directed as shown

FROM MAINTENANCE LABOR COSTS

tion: (1) The average time required to complete a work order has decreased from 5 to 3 hours; (2) trade foremen have better control of their men because they not only know exactly where they are working but also how much time they have spent on each job; (3) since all calls are received at a central point instead of by the trade foremen, as formerly, these men now have more time for active supervision; (4) accurate costs of each job are obtained by the use of a "trailer" card which registers time for each man on each job; (5) acceptance of calls only from authorized individuals in the production divisions has prevented requests for unauthorized maintenance, eliminated the receipt of duplicate orders, and reduced the number of orders received by the department from 400 to 250 per day.

The old system that had grown up

DEPT. CHARGE	ACCOUNT NO.	MAINTENANCE WORK ORDER
434	801	953100

MAINTENANCE WORK ORDER

WORK REQUESTED: Replace Belt 301673

EQUIPMENT AND NO.: Abrasive Grinder

LOCATION | BAY: B-10 | LINE: 434

REQUESTED BY: Don Finley

DATE: DEC 12 | TIME: 13.2 A.M. P.M. | RECEIVED BY: AW

JOB COMPLETED | REMARKS:

JOB STARTED

ELAPSED TIME

ACTUAL LABOR CHARGE

MASTER NO.	WORKED IN	SHIFT	DATE	HOURS	REMARKS

MAINTENANCE WORK ORDER. Carbon-interleaved, pre-numbered, this triplicate form serves to record the telephoned request for work from the production division and also to accumulate a history of the progress and performance of the job

with the plant proved inadequate to modern requirements. Pre-war plant operations of 750 employees on a one-shift basis had allowed close control of maintenance work because it was all performed under the direct scrutiny of the foreman. Steady growth over the past 10 years, however, culminated in a production that now requires over 7500 employees on a three-shift basis, with maintenance operations correspondingly increased.

Under present conditions approximately half the work for which a general maintenance foreman is responsible is done during the second and third shifts and therefore is not under his direct supervision. Also, the old system did not give the foreman an analysis of costs for each job. This analysis has become imperative for economical operation.

Based on these defects, the design of the new maintenance work-order system had three objectives:

1. **Control**—to establish a record for maintaining control of all maintenance work and for obtaining more efficient performance.

2. **Schedule**—to process the volume of maintenance requests in an orderly and efficient manner.

3. **Costs**—to provide evidence to the production divisions (which operate on a maintenance service budget) that they are being properly charged for maintenance work.

Two forms constitute the entire paperwork for the new system. One is a carbon-interleaved pre-numbered "maintenance work-order" form (left) consisting of three copies:

1. Original (pink)—requisitioner's copy.

2. Duplicate (white)—maintenance department.

3. Triplicate (buff)—Audit.

This form (4¼x8 inches) serves to record the telephonic request for work from the production division and also to accumulate a history of the progress and performance of the job.

The second form, officially known as the "daily labor card" (see facing page), is the "trailer" card on which the workman rings *in* and *out* at the start and completion of his work. Likewise carbon interleaved, this form (3¼x8 inches) provides a duplicate which serves also as a tabulating card. Cards may then be mechanically sorted for tabulation to obtain any particular type of analysis that is desired.

Handling Requests

All calls for maintenance services are received in the maintenance control office over a special switchboard. Calls are accepted only from production department foremen who are listed as authorized to request maintenance services. And such requests apply only to jobs costing under $300.

If a job originally thought to be in the "under $300" class is found on closer examination to require a greater expenditure, the production department is requested to initiate a "shop" order. Because a shop order first requires an estimate of its cost and reason for the job by the plant engineering department, it acts as a brake against spending money for the repair of items which have long outlived their economical usefulness and should be replaced.

DATE	MASTER NO.	DEPARTMENT HOME	DEPARTMENT WORKED IN	SHIFT	DAY RATE	ACTUAL HRS.	OVERTIME HRS.	MAINTENANCE WORK ORDER
12/22/47								953 100

SHOP OR TOOL ORDER	SUPERVISOR APPROVAL	ACCOUNT NO.	DEPT. CHARGED
		801	434

MACHINE NO.	MAINT. JOB "OK"-PROD. AUTHORIZATION	JOB COMPLETE ☐ JOB INCOMPLETE ☐	EMPLOYEE NAME
301673 B-10			

OUT / IN EXPLANATION: Abrasive Grinder — Replace Belt

Don Finley

DAILY LABOR CARD

DAILY LABOR CARD (trailer.) Workman uses this card to ring *in* and *out* at the start and end of each job. Duplicates serve also as tabulating cards. All written data can be punched into them, and they can be mechanically sorted to obtain any type of analysis

Flow of Forms

How the two forms (maintenance work order and daily labor card) are used to get maintenance work done, is shown in the flow chart and accompanying explanation on pages 122 and 123. The maintenance control office is staffed around the clock to give full-time service to production departments on 24-hour work schedules.

Office equipment has been kept to a minimum. The four file stations shown in the flow chart are used as follows:

1. Mailbox. This is the lower half of a double-ended pigeonhole rack located at the maintenance switchboard, used for assignment of new work orders. Each trade foreman picks up his outgoing orders regularly from his own partition.

2. Control file boxes. Three compartments are located under the mailbox for holding the office copies of the work orders. They are filed here as "assigned," "incomplete," and "completed" orders.

3. Work order files. Each trade foreman has two file boxes on his desk, for "assigned" and "unassigned" work orders.

4. Collection box. This is the upper half of the pigeonhole rack mentioned in item 1, into which all trade foremen deposit daily their completed orders and all trailers.

Trailer Forms

The work order system provides for all possible deviations from the normal flow shown on the chart. For example, whenever a job is interrupted either by another assignment prior to its completion or by the end of the shift, new trailers are made out for each man upon its resumption. No trailer extends beyond one shift.

Sometimes a maintenance man is assigned to help a production or other service department. In this event, he fills out the customary trailer, but also enters the "production or tool order" in the special space provided. Should he be temporarily assigned to another department over a period of time, he continues to use a new trailer each day, but enters his badge number in the "home" space and the department number in the "worked in" space on this form. Thus full provision is made for accurate cost accounting for any exigency.

If feasible, maintenance men are assigned a series of jobs so as to obviate the necessity for returning to the shop for each assignment. In such event, a man rings *in* when leaving the shop, and rings *out* and *in* when leaving each department where a job was performed, until he finally rings *out* on his return to the shop. In this way, no traveling time is charged to one job that belongs to the next.

On jobs not completed by the end of the shift, the incomplete order in the supervisor's work order file is given to the supervisor on the next shift for make-up and issue of new trailers. Thus, trailers flow daily back to the control office and to the timekeeper for accumulation, records, and labor charges.

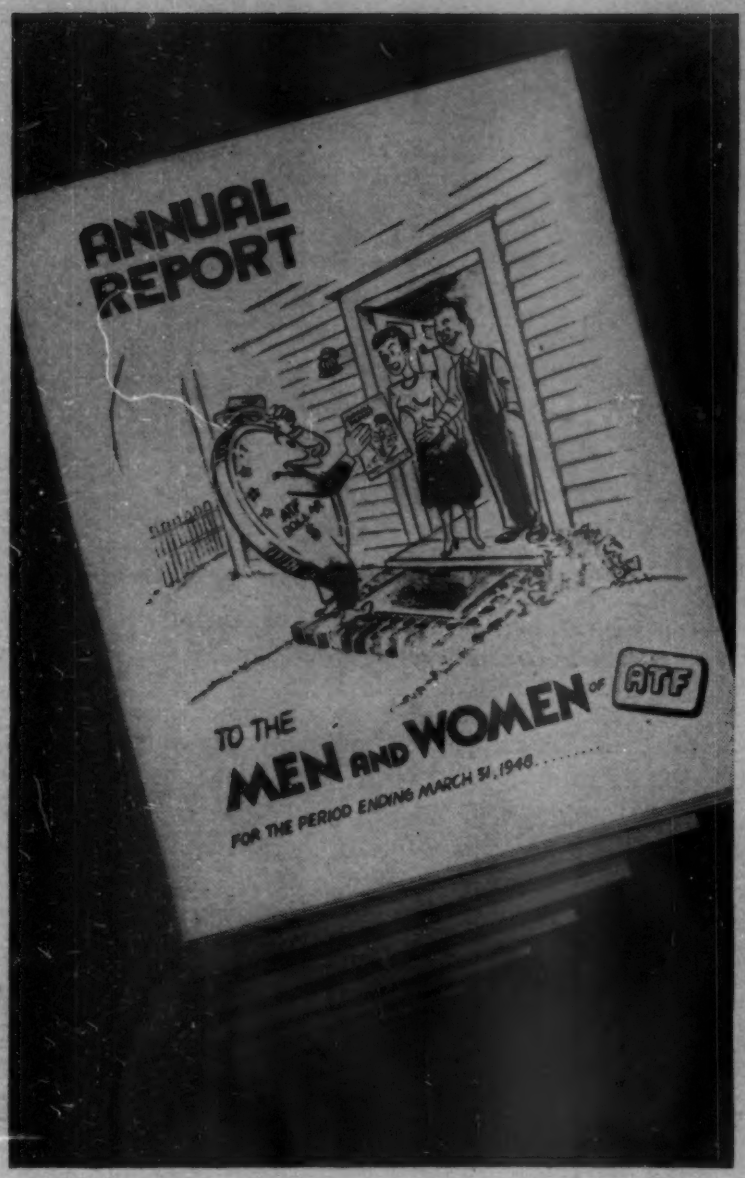
When a job requires the services of more than one trade, the work order is passed in proper work sequence to the various maintenance supervisors. Each supervisor issues his trailers, has his share of the work performed, and relays the incomplete order to the next supervisor. The last supervisor checkmarks the order as completed and puts it in the collection box in the usual way.

Approvals for Control

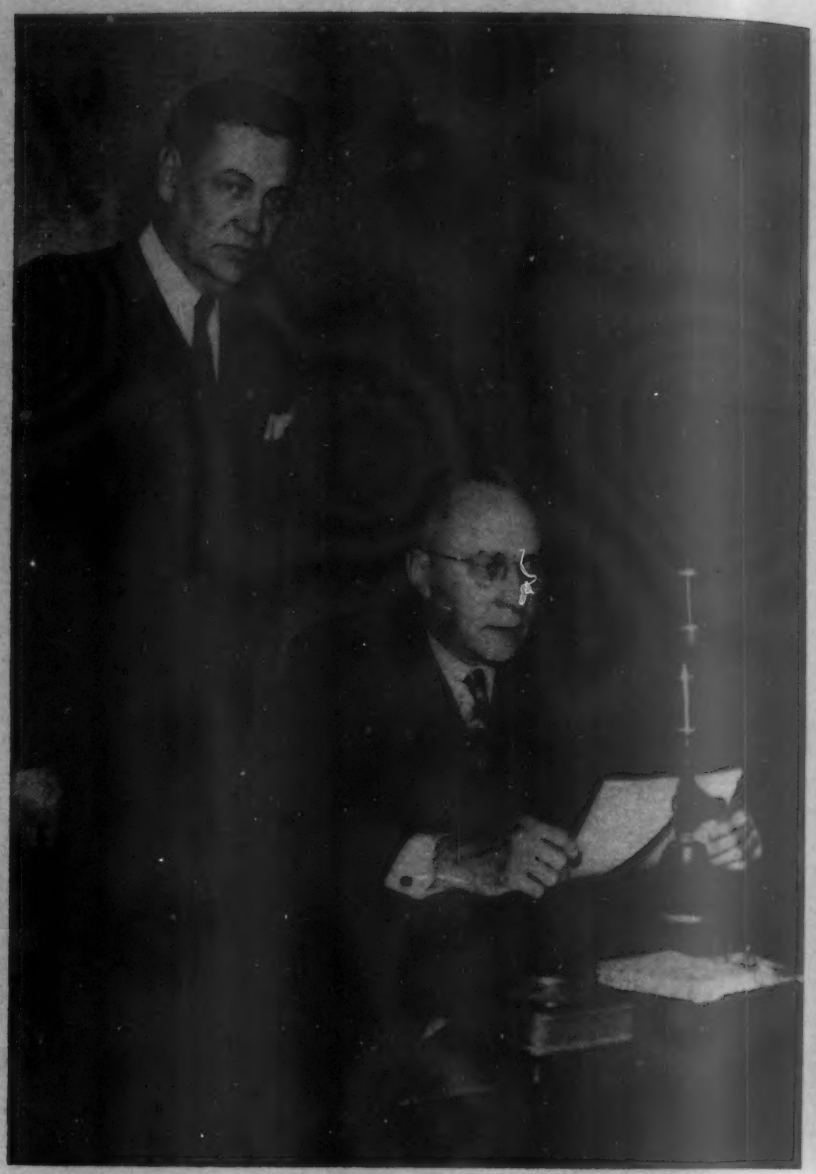
While it may seem that a wholesale series of approvals required of a production supervisor on one job might become bothersome, this is actually the essence of control. In actual practice, the number of trailers that must be approved per day by each supervisor averages about six.

Routine jobs of a scheduled preventive maintenance nature—such as lubrication and instrument checking—are also controlled by trailer cards. Time charges for these are not made to a specific order number, however, but rather to one standing account (general indirect labor).

Emergency jobs are no exception to the routine. When the control office receives an emergency call, it goes through the usual motions of preparing the work order and trailer. In addition, these forms are stamped "emergency," and the maintenance supervisor is immediately advised of the urgency.



COVER OF 1948 report automatically suggests that material inside will be in graphic, easy-to-understand form — not just figures



RECORDING IS MADE by president of his message to employees. Author, representing human relations department, "supervises"

REPORTS TO EMPLOYEES THAT

Improved techniques may enable ATF's 1948 report to top last year's record of 90 per cent readership

BENJAMIN F. McCLANCY • DIRECTOR, HUMAN RELATIONS, ATF, INC., ELIZABETH, N. J.

THE 1948 "Report to Employees," which ATF, Inc., sent to all members of the working force on June 8, was scientifically pre-engineered to guarantee that it would get high readership.

Three years ago, Thomas Roy Jones, ATF president, wanted to know if the company's annual report to employees was really being read. He engaged an independent research company to survey our employees and find out. The result was not particularly happy. Only 35 per cent of our employees had read the 1945 report.

But the study pointed out certain weaknesses which we were able to remedy. Consequently, the 1946 report achieved a readership of 65 per cent. The principal change was the elimination of "cold figures," and their replacement with pictorial representations. However, the survey indicated that 23 per cent of our employees thought the report did not give a "true picture" of the company's financial operations.

Our president suggested that the way to overcome this feeling was to "talk it over" with employees *before* making up the 1947 report. To facilitate this procedure, responsibility for the preparation of the report was placed in the hands of the department of human relations. Content, manner of presentation, even the layout and art work, of a virtually all-cartoon report were determined and executed by ATF employees.

The subsequent survey showed that this new approach paid off handsomely. Over-all readership was 90 per cent. And the 23 per

FIRST TWO PAGES of report present the message. Recording is taped to right hand page over printed copy of message. Survey of all employees disclosed 75 per cent had facilities for listening to this personalized report by the company president

REALLY GET READ

cent who had previously expressed doubt as to the completeness of the report was reduced to only 5 per cent.

All of the data assembled in the three earlier years, plus the proved technique of consultation with employees, were put to work in building the 1948 report.

Some examples of the ways in which we have taken advantage of this knowledge are illustrated on these pages. For instance:

Our research disclosed a high degree of interest in the dollar breakdown ("where the money goes") in earlier issues. We capitalized on this interest by presenting the "ATF dollar" on the cover. This, we hope, will remove any doubt that the report is cold and statistical. At the same time it will be a definite indication that by opening the cover, the reader will find the answers to his "dollar" questions.

We found, too, that more than 75 per cent of our employees had facilities for listening to phonograph records. We coupled this fact with the known desire of many employees to hear about the company from the president, personally. The result was the inclusion in the 1948 report of an actual phonograph record of a message delivered by him.

Naturally, we made provision for the 25 per cent of our employees who might not have access to a phonograph. This was done by preparing the president's message in the form of a letter, on the third page of the report. The pasteboard record was affixed to this page, over the letter, by transparent tape.

The cost of this new type of presentation was not excessive: About $350 to produce a first-rate "master record" of the 1½-minute message, and about 10 cents each for the paper impressions sent to each of our 3000 employees.

In examining "multiple readership" of our 1947 report, we found that about two-thirds of our employees reported that other members of their families had read it. But more interesting still was the fact that, in many families, the

pre-school children had used the report as a color book.

We found that when parents laid the report aside, children would take their crayons or colored pencils and decorate the cartoon papers. *And then they took the report back to their parents to show them their work.* The result was that many parents were practically forced to reread portions of the report.

The 1948 report carries this process one step further. Not only are cartoons available for coloring, but the center two pages are so arranged that, when opened, a drawing of a typical residential street "pops up." The message carried on these pages—that workers, stockholders, and management are all "people"—is important. It is our hope that this novelty presentation will result in its being seen not once but many times.

90% OF ATF EMPLOYEES READ THE 1947 REPORT

These are the features they remember best . . .

76%—the section on plants and products

67%—the dollar breakdown

58%—the financial statement

58%—the ATF family

49%—the ATF aims

49%—the teamwork story (before dollar breakdown)

43%—Mr. Jones's (president's) letter

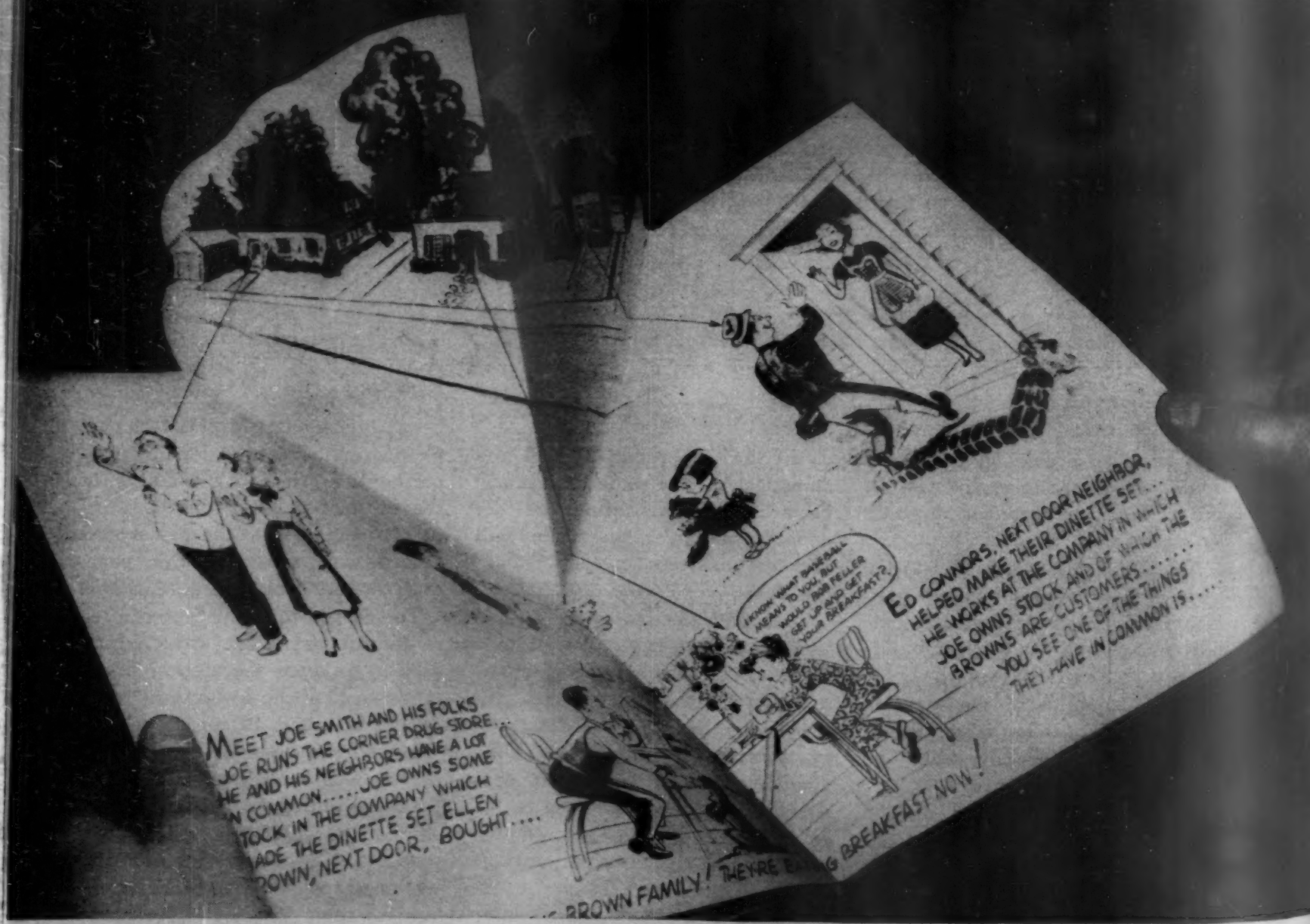
35%—the organization chart

35%—the teamwork story (conclusion, after dollar breakdown)

20%—the credits (inside back cover)

Employees hired between June, 1947 (when the report was issued), and December, 1947 (when the survey was made), did not receive copies, and are not included in the tabulation

Data from an independent study made by Opinion Research Corporation, Princeton, N. J.


MEET JOE SMITH AND HIS FOLKS
JOE RUNS THE CORNER DRUG STORE...
HE AND HIS NEIGHBORS HAVE A LOT
IN COMMON.....JOE OWNS SOME
STOCK IN THE COMPANY WHICH
MADE THE DINETTE SET ELLEN
DOWN, NEXT DOOR, BOUGHT....
I KNOW WHAT BASEBALL MEANS TO YOU, BUT WOULD JUST FELLER GET UP AND GET YOUR BREAKFAST?
ED CONNORS, NEXT DOOR NEIGHBOR, HELPED MAKE THEIR DINETTE SET... HE WORKS AT THE COMPANY IN WHICH JOE OWNS STOCK AND OF WHICH THE BROWNS ARE CUSTOMERS..... YOU SEE ONE OF THE THINGS THEY HAVE IN COMMON IS.....
BROWN FAMILY! THEY'RE
BREAKFAST NOW!

CENTER SPREAD "POP-UP" springs up from pages when report is opened. Admittedly a novelty, ATF has found that children will color the cartoons in reports, bring it back for parental inspection. It is hoped this arrangement will create similar "second readings"

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

It took ailing Walter Reuther to put starch back into CIO's sagging third-round wage drive. The 11-cent raise he nailed down at General Motors — without striking — raised questions for both management and labor.

Does it mark end of price-cutting experiment begun by Big Steel when it gave big "NO" to Murray?

Has a pattern been set which other major employers in heavy industry will have to follow to avoid strikes?

Did General Motors stem the rising tide of big strikes?

U. S. Steel took the bull by the horns, tried to turn management toward lower prices, no wage boosts.

For steel, with its two-year contracts, this raised no real problem. Other industries risked strikes.

Reuther's UAW struck first — at Chrysler. This was to be the showdown on Round Three. With 75,000 Chrysler members walking the picket line and 225,000 due to go out at GM, the big break came. GM settled.

Most significant in GM settlement: *Quarterly wage changes are pegged to cost-of-living — both upward and downward.* If living costs drop, GM workers can lose 5 cents of the 11-cent raise.

Murray's steel workers haven't given up hope for a wage increase this fall — if other unions get them. Especially if Lewis rings the bell again, forcing concessions in the steel industry's captive mines.

We also heard this kind of talk at steel union's Boston convention: *"The price-cutting experiment will flop. Then the industry will give in on wages."*

Except for a few Communists, the delegates backed Murray's decision to honor the contract's no-strike ban. If other workers suffer huge strike losses this year, Murray won't look so bad if he nails down a good-sized gain next spring.

Some unions prefer to wait and see. They've signed up without wage increases, but with a chance to cash in later. That's happened in flat glass, telephones, shoes.

●

Meanwhile, pressure gets stronger for welfare benefits. Murray is adding $150-a-month pensions to earlier demands from steel for hospital and life insurance. His cost figures for all benefits: 23 cents an hour.

Union-negotiated welfare plans are new in heavy industries. Study by Federal Security Agency of 36 steel companies shows 50 employee-benefit plans. *Only one has been put in union contract.* It's at Allegheny Ludlum. And only 13 include pensions.

A boon to unions' pension demands comes from NLRB's rule that employers can't keep them out of bargaining talks. The rule was set in Inland Steel case. It also hit General Motors. Lewis paved the way in coal.

Recent experience discloses need for more actuarial data on pension costs. Look what happened on miners' pensions. Lewis grabbed more than the 10-cent-a-ton royalty will carry. Now he wants a higher royalty.

Trouble looms for another new pension plan—National Electrical Benefit Fund. Electrical contractors kick in 1 per cent of payroll to match the 60-cents-a-month contribution of AFL electricians. Union members with 20 years' service get $50 pension at 65. After a year, it's evident the fund won't carry the load.

●

It looks like another coal strike in July. Unless mine operators cave in to Lewis again. Another injunction would be the third against Lewis in three years.

What's behind Lewis's quarrel with southern operators? Our guess: A maneuver to make a deal with captive operators, force it on southerners. It's an old trick.

CIO's left-wing unions pay a big price for not filing non-Communist affidavits. Picking up many of the chips — Reuther's UAW-CIO. It took New England locals from UE, a precision castings plant from the Smelter Workers, and Caterpillar Tractor from Farm Equipment Workers.

Many UAW-CIO openings come from employers refusing to bargain with Communist-led outfits. Crisis grows in the smelter union. *The castings division has asked CIO to give it "shelter" in a right-wing union.*

Murray expects to test affidavit rule in Supreme Court. That's why Steelworkers delay complying. To pin-point affidavit issue, this union is meeting all other requirements of law. *It now bars Communists from office.*

Here's where NLRB says employers stand in regard to plant guards under Taft-Hartley: They don't have to bargain with the union if it's affiliated with CIO, AFL, or any other organization that takes in non-guards

On craft units, NLRB won't okay a union deal to split up a plant-wide group if management objects.

On free speech, employers won't violate law if they make uncoercive anti-union speech. But anti-union "atmosphere" may force new election if union loses.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Look for level—or slightly rising—business through election time.

Going into summer, the business outlook is optimistic with no great swing up or down in sight. Employment is reaching for new records this month as summer workers and seasonal farm labor go on the payroll.

Production, after recovering from the spring coal strike, is near peak levels, but limited by strikes.

Prices are rising slightly, riding the wave of optimism touched off by tax cut, bigger defense appropriations, and upturn in stocks. *So—barring prolonged, widespread strikes, or other catastrophes—the outlook is bright.*

●

The impact on business of bigger military appropriations, foreign aid, and allocations for essential domestic industry can be seen in steel requirements for these special programs.

The pinch isn't going to be as great as forecasters looked for. Combined requirements of foreign aid, defense, and domestic allocations for steel are estimated at 17 to 17.5 million tons. But that is an increase of only about 3 million tons over what the industry is now shipping for these purposes—or 5 per cent of the U.S.'s total estimated 1948 finished steel production of 65 million tons. *Steel will still be tight, but not as tight as pessimists expected.*

How backlogs will stabilize industry for the next few years is shown in a Commerce Department study. Before the war auto sales showed a maximum range of 4 to 1 in sales between good years and bad. Refrigerators showed a 3 to 1 range. Other industries saw similar swings. Now, says the Department, demand built up during the war and post-war years is still strong enough to hold production high over the next few years.

Vacuum cleaners will be the first of five major consumer durable products, studied by the Department, to feel the effects of easing demand. Washing machines, refrigerators, and autos will follow, in that order. While the backlog for conventional radios is about gone, FM and television are opening up new markets whose ceiling can't be measured yet. *Because the backlogs will go one after another over the next few years—not all at once—the switch to normal markets for industry as a whole will be comparatively easy.*

Demand for new automobiles hit a new peak this spring and the industry estimates it needs two years to fill orders now on dealers' books. The Commerce Department study shows that even turning out 3.5 million cars this year will leave more over-age cars on the road than there were at the beginning of the year.

Western Europe is getting off to a good start on recovery, but has a high hurdle ahead. A survey by the United Nations Economic Commission for Europe claims that Europe's production in both industry and agriculture has recovered faster than it did in the comparable period after World War I. All the major nations except Germany, Italy, Austria, and Greece, are getting out more industrial production than they were in 1938—although the collection of goods is far different from what it was in '38.

Great Britain in the first quarter of 1948 turned out 119 per cent of the 1938 average; France, 102 per cent; Belgium, 113 per cent; and Norway, 127 per cent. Coal and steel output in Western Europe reached its pre-war level, easing supply problems for industries in that area.

But now the nations come bang up against the heart of their production problem. So far they have scored production increases by putting more people to work and working them longer hours. From here on, the big problem will be to get more production with no more workers—for most of the countries face labor shortages. That can be done only by increasing productivity, getting out more work for each hour worked.

That takes new plants, new machines, new equipment. So Western Europe, even with Marshall Plan aid, is up against a tough decision: How much material can be diverted from badly needed consumer goods to plow into new capital equipment that will eventually raise consumer goods production. It's a question of bread *now*—or machines that will provide more bread, and even butter, *later.*

●

Something new to watch out for: *Seasonals are back.* The swings put into business by the weather and the calendar, which were largely wiped out during the war, are back now. Some two million businesses that have opened up since 1941 don't know what seasonal influences are. Millions of other businessmen have forgotten what they were because rationing, military orders, and full employment leveled them out during the war.

Now some of the old seasonals are back practically unchanged. Easter is again the boom time for the apparel trades, for example.

New seasonals are coming up, too. One—government money—is perhaps the most potent of all. *Draining off some $16 million in one fell swoop for tax collections in the spring slows business all around.* And summer vacations—now written into many union contracts—may put a new swing into your business this summer.

So—check the calendar before you decide that the bust is on.

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for.

LUNCH WAGONS ON THREE-SHIFT PLAN

Lunch wagons which help solve the between-meal feeding problem at Weatherhead Company, Cleveland, are merely a long arm of the company cafeteria.

These wagons are stationed where they can serve the most people, and they are always under the watchful eye of a foreman.

The canteens, like the workers, follow shifts. Five canteens are sent out to strategic spots each morning at 7:30—half an hour after the first shift starts work—and return at 12:30. Three canteens serve during the afternoon, and only one is needed to serve the smaller night shift.

The purpose of this between-meal plan is, of course, to keep regular and piecework production at a high point. The items found most satisfactory are sandwiches, cookies, doughnuts, sweet rolls, oranges, apples, coffee, and milk. Everything handled on the lunch wagons is wrapped in waxed paper.

In addition to the canteens, vending machines for soft drinks, candy bars, gum, ice cream, and cigarettes are located throughout the plant.

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PROJECTS LISTED IN LOCKER ROOM

A complete list of all equipment and machines in process of being built is posted in the employees' locker room at Ingersoll Milling Machine Company, Rockford, Ill. Workers like to see the black mark put through the units completed each day. And they like to see the new ones added.

The board, mounted at the front of the locker room, is in a conspicuous location. Employees must pass this point when entering or leaving the plant. The board is approximately 4x5 feet, with lettering clear enough to be read many feet away.

The project board had done two things, (1) made employees conscious of the work to be done, and (2) given them an incentive—to see the "black mark" put through the completed units. Supervisors stop by each day to check how things are coming. The board gives them a quick picture.

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ELECTRO-MAGNET REMOVES METAL SPLINTERS

An instrument that is credited with having, in many instances, eliminated the need for surgery, is in use at The Autocar Company, Ardmore, Pa.

Called "Maggie" by workers, an electro-magnet takes out the metal splinters that, in spite of extreme care and

CONSUMABLE PALLETS SAVE MANY MAN-HOURS

Time required to unload zinc ingots from freight cars has been reduced from 64 to 2 man-hours at Oliver Iron & Steel Corporation, Pittsburgh.

Formerly about two hundred 55-lb. ingots were received loose in a carload. It took approximately 8 man-days to unload them.

Realizing the tremendous savings that could be effected, Oliver worked with the supplier to design a consumable pallet of the same composition as the ingots, which would facilitate both loading and unloading procedures.

Now 48 ingots are strapped to a pair of pallets. As they are loaded by the producer, the lifts are located for ease of removal by lift truck, and are steel-strapped in the car to assure maintenance of position. This change in method alone has reduced unloading time for a carload to 2 man-hours. This includes the time required to open the car door and loosen the strapping. In addition, the pallets, since they are consumable, represent no loss to either the producer or the company.

safety programs, occasionally run into the arms, hands, and faces of the men who operate lathes, shapers, milling machines.

Mounted on a swing arm on the wall of the dispensary, "Maggie" resembles a small bomb. It is about 19 inches long, has a steel core tapered to a long fine point at one end. Power is controlled by a foot pedal easily operated by the doctor.

When a metal splinter is so small it cannot be seen in the flesh, the infirmary's X-ray machine is used to locate it. Then the electro-magnet draws it out. Splinters up to 3 inches long have been removed with a minimum of tissue damage.

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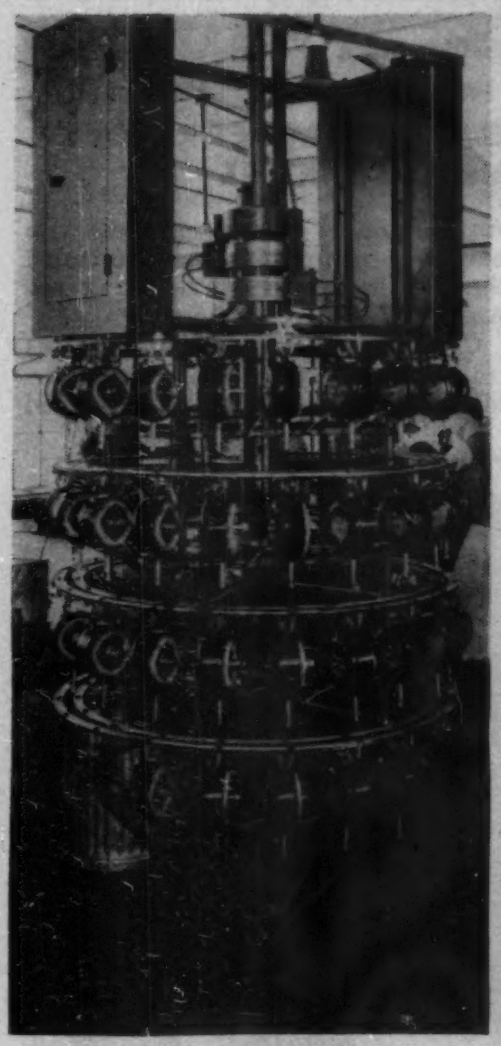
AIR-OPERATED FIXTURE bends tubing 60 per cent faster at South Wind Division, Stewart-Warner Corporation, Indianapolis. This tubing used to be coiled by winding around by hand. The fixture saves more than 800 man-hours a year, does a better job, and reduces effort

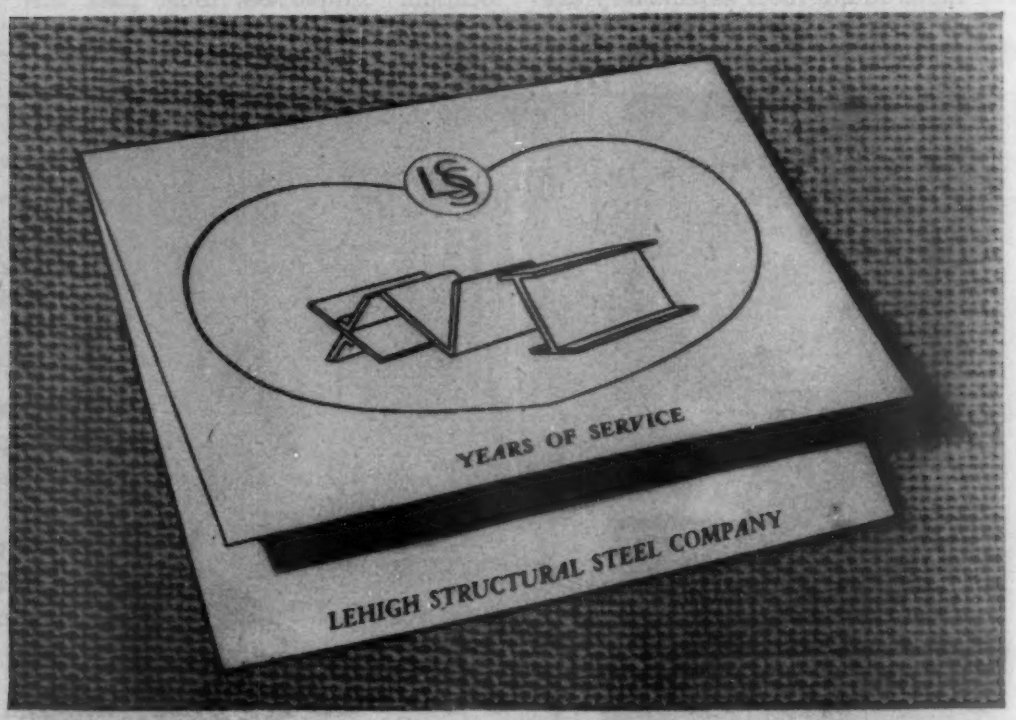


MOTOR RUN-IN RACK SAVES FLOOR SPACE

A motor test rack, known as the "Christmas tree" by employees at the Emerson Electric Manufacturing Company, St. Louis, is saving floor space, practically eliminating walking, and increasing operating efficiency. It used to be that motors were run-in on long benches, which called for excessive floor space and long walking distances for the workers.

Now that is all eliminated. The "Christmas tree" is located near the main assembly line. As the motors feed past the test operator, they are removed from the main line and placed on the rack for a 2-hour run-in. Rotors on the 12- and 16-in. fans operate on stationary, tapered, hollow steel shafts, and the run-in period assures the fit of the bearing surfaces.

Each rack accommodates 80 motors in the space originally required for ten. The rack can be rotated through 360 degrees by hand.



GREETING CARDS of unusual design are sent to employees of Lehigh Structural Steel Company, Allentown, Pa., on the anniversaries of their employment. The card, illustrated with Roman numerals made up from standard steel shapes in a red outline heart, show the years of service—from 1 to 30 years. (Card above is for 16 years.) Inside is the message, "Time passes inexorably on as the heart of industry beats out its progress in the form of structural giants outlined on the timeless sky. All important to progress is this heart, the men and women who work faithfully through the years. The Lehigh Structural Steel Company is proud to recognize the importance of your length of service, for making up the Heart of Lehigh is You"

ENVELOPE STUFFERS GIVE COMPANY FACTS

Information on current economic and company facts is being furnished employees of American Radiator & Stand-

ard Sanitary Corporation, Pittsburgh, through small pamphlets placed in employees' pay envelopes at the end of each month.

The first pamphlet was issued in December, 1947. Entitled, "Meet American-Standard," it discussed the complexity of the 30,000-man organization and outlined a program to give employees facts about products, plants, and markets. Pamphlet No. 2, in the January, 1948, envelopes, outlined the business prospects for 1948. The February pamphlet described the American-Standard family, and in March it was devoted to pertinent comments on the annual report for 1947.

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HOT COFFEE goes a long way in increasing plant efficiency, and bettering employee relations, believes the management of John A. Roebling's Sons, Trenton, N. J. This company recently installed a hot coffee vendor, so that now the workers can continue to produce at their workplaces—and at the same time enjoy their coffee. And they can have it white or black, with or without. Separate pushbuttons for cream and sugar enable them to take it as they like it

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OUTDOOR SIGN KEEPS WORKERS "IN THE KNOW"

SOURCE: Wagner Sign Service, Inc., Chicago

To help keep its workers up to date on policies and programs, the American Pulley Company, Philadelphia, uses a large sign, with changeable letters. The letters, which are 4 inches high, are of the slotted type attached to horizontal rods. New messages can be quickly arranged without the use of any tools, Changing the messages frequently helps sustain worker interest.

CRANE TRUCK USED TO SERVICE HIGH FIXTURES

SOURCE: The Yale & Towne Manufacturing Company, Philadelphia

Additional, and perhaps somewhat unusual, use is made of a crane truck at the Caterpiller Military Engine Company, Decatur, Ill. When not loading and unloading rail cars and handling raw materials in the plant yard, it can be used for installing and maintaining overhead lighting fixtures, servicing piping, air conditioning units, sprinkler systems, skylights, and high windows.

These applications are made possible by mounting a platform on the end of the boom. The positive control of the truck makes accurate positioning of the platform possible. Its mobility makes it easy to follow the job. Safety railings around the platform, outside racks for materials, and a small box for tools, make for speedier and safer work.

Proper scheduling allows this usage without interference with the regular duties of the truck.

NO TIME IS LOST by maintenance men at Woodward Governor Company, Rockford, Ill., in hunting around for tools. All major maintenance tools are kept on a board, where millwrights, pipefitters, and electricians can see what they want and get it easily and quickly. Good housekeeping is encouraged, and plenty of time is saved

management data 30 sheet

FOREMAN'S GUIDE FOR SHOP RULES AND PENALTIES

	FIRST OFFENSE	SECOND OFFENSE	THIRD OFFENSE
1. Employees must not destroy company tools, machines, materials, or equipment	Discharge		
2. Employees must not have weapons in their possession on company property	Discharge		
3. Employees must not misuse, or remove from company property without proper authorization, company lists, blueprints, records of confidential information of any nature. Employees must not steal from each other or from the company	Discharge		
4. Employees who are working on piecework jobs must have a reasonable excuse for not making the guaranteed day-work rate[1]	Warning	Warning	Discharge or transfer
5. Employees must not fight on company property at any time	Warning — 1-week layoff for all concerned	Discharge	
6. Employees must not abuse property of company or other employees	Warning	Warning—1-week layoff	Discharge
7. Employee must ring his own clock card *only*	Warning	Discharge	
8. Employees must not have more than one month's rating of *poor* on their individual merit rating sheets	Warning	Warning	Discharge
9. Employees must observe safety rules and practices	Warning	Warning	Discharge
10. Employees must not be repeatedly absent or tardy	Warning	Warning	Warning—layoff up to 1 week. For repetition, discharge
11. Employees must not waste time by loitering in toilets or elsewhere on company property during working hours	Warning	Warning—1-week layoff	Discharge
12. Employees must not gamble or participate in games of chance on company premises at any time	Warning	Warning—layoff up to 1 week	Discharge
13. Employees must accept jobs assigned to them and must at all times obey orders of the foreman or other supervisor	Discharge		
14. Employees must not restrict output	Warning	Warning—1-week layoff	Discharge
15. Employees must not report for work drunk, nor bring or drink liquor on company premises at any time	Warning to discharge, depending on severity	Warning—1-week layoff	Discharge
16. Employee conduct on company premises must be moral and decent	Warning—if severe, discharge	Discharge	
17. Employees must not threaten, intimidate, coerce, or interfere with fellow-employees on company premises at any time[2]	Warning	Discharge	

[1] 4. Not necessary to make out notices after each warning. Said notices should be spread out to give employees an honest chance

[2] 17. If coercion is practiced by employees of one department on employees of another department, it should be brought to the attention of the personnel department, which will issue warning notices to coercer

Source: United Specialties Company, Chicago

CONTINUED ON PAGE 136

ELWELL-PARKER PAPER LIFT TRUCK

ELWELL-PARKER FORK TRUCK

Battery Electric Trucks and EXIDE-IRONCLAD BATTERIES

The time-saving team that cuts handling costs

In more and more plants, management is finding the right answer to its material handling problem by using Battery Electric Trucks. Time is being saved—more tons per man, per hour. Handling costs have been cut as much as 50%. More storage space is being utilized by high tiering. All combine to effect substantial savings that help to offset increased manufacturing costs.

When electric trucks are powered with Exide-Ironclad Batteries, they keep on the job, all day long, lifting, hauling and stacking materials. The completely different construction of Exide-Ironclad Batteries results in (1) high power ability, (2) high electrical efficiency, (3) ruggedness and (4) exceptionally long life. Only Exide-Ironclad Batteries have these four essential characteristics.

Speed up your material handling. Cut your handling costs. Put Battery Electric Trucks and Exide-Ironclad Batteries to work in your plant.

Write for further particulars and FREE copy of Exide-Ironclad Topics, which covers latest developments in material handling and shows actual case histories.

1888 . . . Dependable Batteries for 60 Years . . . 1948

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

management data sheet

FOREMAN'S GUIDE FOR SHOP RULES AND PENALTIES

CONTINUED FROM PAGE 134

	FIRST OFFENSE	SECOND OFFENSE	THIRD OFFENSE
18. Employee must not leave his department or plant during working hours without permission	Warning	Warning	Warning—layoff up to 1 week
19. Employees must furnish a doctor's statement when requesting a sick leave, and at 3-month intervals thereafter if extension is necessary	Loss of seniority		
20. Employees must not throw refuse on floors or out of windows	Warning	Warning	Warning—layoff up to 1 week
21. Employees must not make scrap unnecessarily	Warning	Warning—layoff up to 1 week	Discharge
22. Employees must not create nor contribute to unsanitary conditions	Warning	Warning—layoff up to 1 week	Warning—layoff up to 2 weeks
23. Employees must not indulge in horseplay, scuffling, or throw things, on company premises	Warning	Warning	Discharge
24. Employees must not use abusive language to their workers or supervisors	Warning	Warning—layoff up to 1 week	Warning—layoff up to 2 weeks
25. Employees must not assign their wages or have them garnisheed[3]	Warning	Warning or discharge	Discharge
26. Employees must not solicit nor collect contributions on company premises without written authorization[4]	Warning	Warning	Warning—layoff up to 2 weeks
27. Employees absent three days must notify plant of cause[5]	Discharge if without reasonable excuse		
28. Employees must not distract attention of others by yelling or by demonstrations in the plant	Warning	Warning	Discharge
29. Employees must not make false or vicious statements about other employees, the company, or its products	Warning	Warning	Discharge
30. Employees must not distribute any written or printed literature on company premises without written authorization	Warning	Warning—layoff up to 1 week	Discharge
31. Employees must not post or remove notices or signs on bulletin boards or elsewhere without specific authority	Warning	Warning—layoff up to 1 week	Discharge
32. Employes must use only tools, machines, and equipment specifically assigned them	Warning	Warning—layoff up to 1 week	Discharge
33. Employees must notify foremen when 30 minutes late	Warning	Warning	Warning—layoff up to 1 week
34. Employees must notify foremen in advance when they expect to be absent	Warning	Warning	Warning—layoff up to 2 weeks
35. Employees must be at work stations when whistle blows	Warning	Warning	Warning—layoff up to 2 weeks
36. Employees must not prepare to leave work before whistle blows	Warning	Warning	Warning—layoff up to 2 weeks

[3] 25 Personnel department to make decisions on abuse of this item

[4] 26. Must get in touch with personnel department for necessary authorization

[5] 27. It is permissible to rehire said person as new employee with loss of all seniority

Source: United Specialties Company, Chicago

Cutting Out the "Chatter" Improves Quality

SUNOCO WAY LUBRICANT...

Increases Accuracy, Eliminates Need for Extra Grinding

A manufacturer of steel products was having trouble with the lubrication of five milling machines. The tableways and cross-slide ways were becoming coated with heavy, dark brown deposits which caused severe chattering. An extra grinding operation had to be specified, and many pieces were rejected because of the quality of the machining.

An outstanding performer, Sunoco Way Lubricant, was recommended by the Sun Engineer who was called in for consultation. With this lubricant in use, table chatter was completely eliminated. Better tolerances were obtained. The additional grinding step was no longer necessary.

Quality of the dies that are being milled has been much improved, and the management now states it would not use any other lubricant on these machines.

Increased production and improved quality are typical results in plants where Sun "Job Proved" lubricants are used. In machine shops, in power plants, in quarries, mines, mills and factories, Sun "Job Proved" lubricants help to "produce more for less." For full information on the Sun lubricants for your machines, call the nearest Sun office, or write Department F-6.

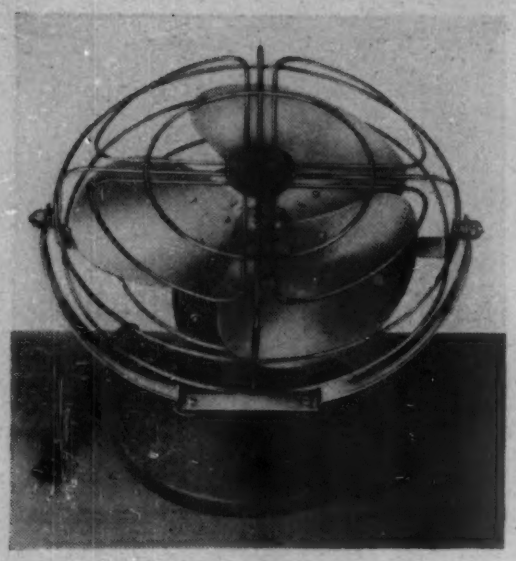
SUN OIL COMPANY • ***Philadelphia 3, Pa.***
In Canada: Sun Oil Company, Ltd. — Toronto and Montreal

SUN
SUNOCO

INDUSTRIAL PRODUCTS

WHAT'S NEW IN EQUIPMENT

Briefed here—for the convenience of plant operating men—are descriptions of industrial plant equipment newly placed on the market



AIR CIRCULATOR

Mounted on a bracket with smooth friction pivots, 10-in. fan can be turned to discharge air straight up, down, horizontally, or at any angle in a full 360-deg. vertical circle. Rubber molding around the 8-in. base makes the fan steady and safe to use on any surface, according to manufacturer. May also be mounted on wall. A 24-in., 3-speed oscillating model also is available. G-M Laboratories, Inc., 4300 North Knox Ave., Chicago 41.

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FIREFIGHTING TRAILER

Pulled by a jeep or pick-up truck, firefighting trailer has a two-compartment tank carrying 250 gallons of water and 25 gallons of foam-making liquid, which combines, maker claims, to make 2500 gallons of thick foam. Equipment includes two all-purpose nozzles for use with either water or foam; 50 gallons of Aer-o-Foam liquid; CO_2 extinguisher and mounting; two hose reels, automatic type, with adjustable stuffing boxes. Pump produces 100-lb. pressure. Trailer has connection cable and safety switch for hooking onto pick-up truck. National Foam System, Inc., 350 5th Ave., New York 1.

SPRAYING UNIT

Portable pressure spraying unit, known as the "Spartan," is said to deliver up to 3 g.p.m. and to operate at any pressure up to 200 pounds. Suitable for use in pest control in buildings where high pressure is needed to drive spray material into inaccessible places, and for fly, mosquito, and weed control. It can be used for whitewashing and for emergency fire control. Mounted on large-diameter, pneumatic-tired wheels, it is equipped with a height positioner, adjustable to hold the unit level when in use. A 20-ft. aluminum extension with a fan spray gun can be adjusted from a driving stream to an atomized fog. John Bean Mfg. Co., Lansing, Mich.

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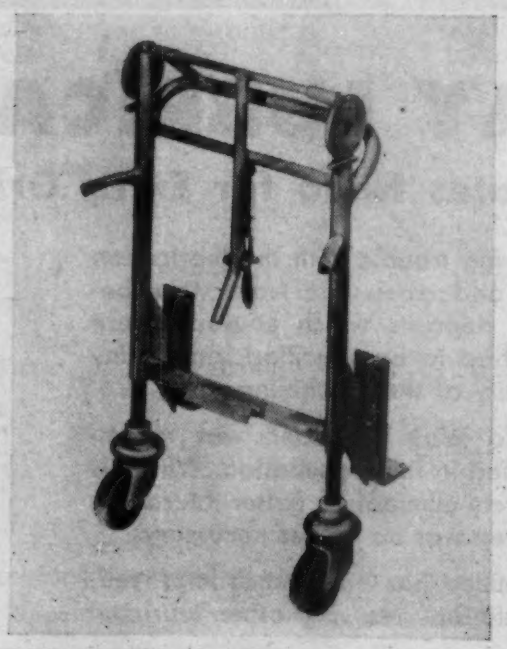

LIFT DOLLY

Designed for moving bulky cargo, dolly, called the Perfecold Liftruk, permits movement of cargo in and out of tight places without adjusting loads. Consisting of a pair of two-wheeled dollies, the Liftruk set has a capacity of 2500 pounds. The apparatus is portable, can be carried on delivery trucks, and stored in small space. Comes with rubber-tired wheels, handle lock to insure safety, and lifting handles for guiding and lifting load over varying floor levels. Perfecold Industries, 1946 South Main St., Los Angeles 7.

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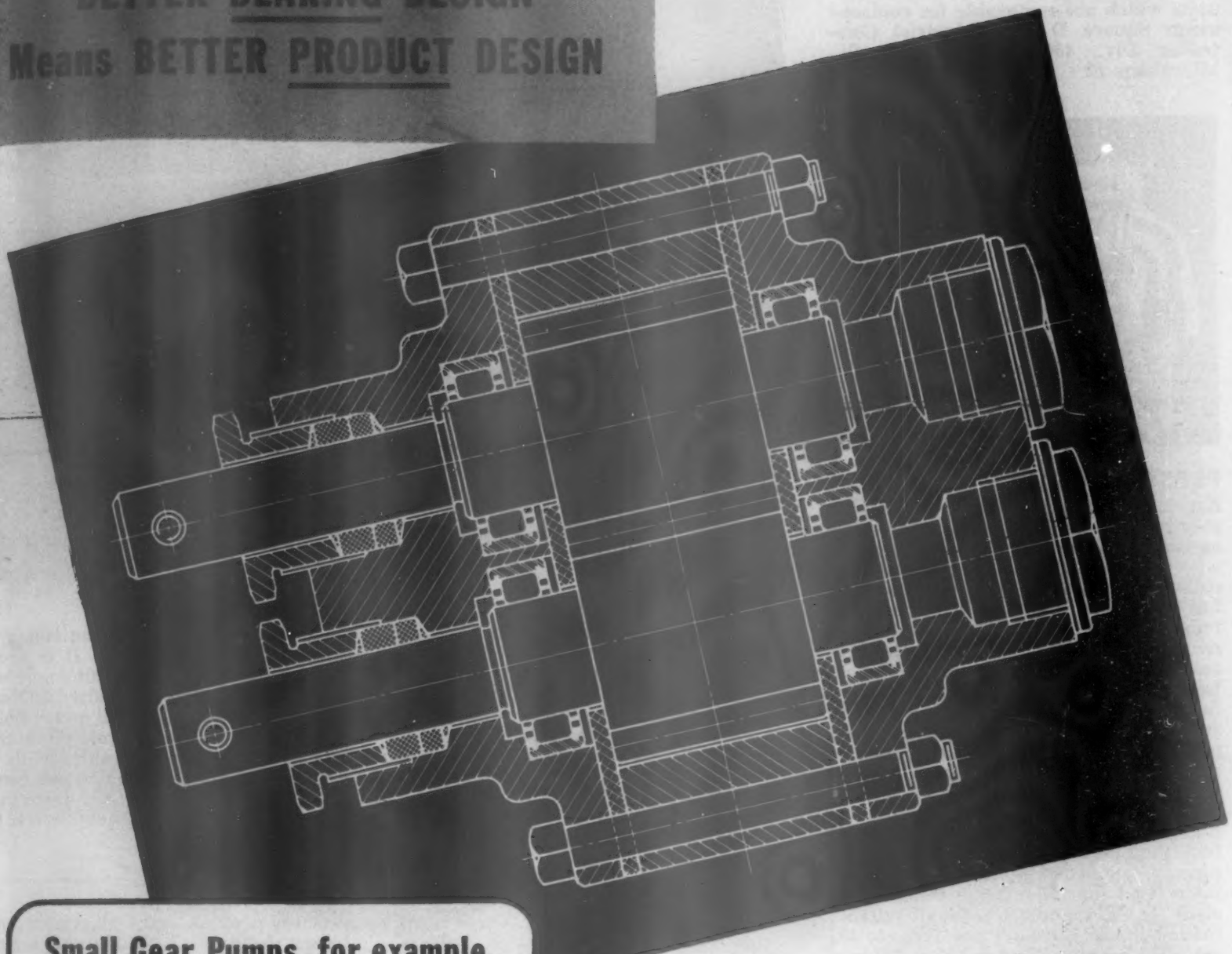
FOOT SWITCH

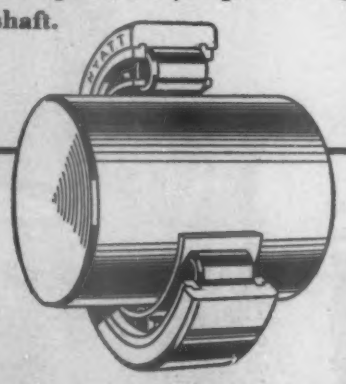
Heavy-duty, oil-tight foot switch, enclosed in a heavy cast case, is gasketed for oil-tight applications. Maker states that it is compact in design, and hugs the floor to prevent tipping. Wide pedal is operable from three directions, but is protected against accidental contact or falling objects. It has an adjustable stroke, short motion, and slight angle to eliminate ankle fatigue. Self-contained contact mechanisms are replaceable. Snap action contacts are rated 600 volts pilot duty, a.c. or d.c. Contact arrangements are single pole, double throw; double pole, double throw; and two stage (each stage being single pole, double

BETTER BEARING DESIGN
Means BETTER PRODUCT DESIGN



Small Gear Pumps, for example.

Shorter distance between the shaft centerlines, without sacrificing shaft diameter—free floating shafts, permitting pressure balancing—and ease of assembly—are features which add to the overall compactness and efficiency of this design. Hyatt Hy-Load Roller Bearings made it possible because they have greater radial load capacity than any other bearing of the same standard size and type. And Hyatt design permits omission of the bearing inner race—thereby, either reducing the required bearing O.D. space, and/or permitting the use of larger shaft.



Better design and better performance—not only in gear pumps, large and small, but in virtually every type of industrial equipment—is a "matter of record" where Hyatt Roller Bearings are used. That's because fitting the bearing to the job—not the job to the bearing—is the Hyatt way of engineering.

Thus, when Hyatt Roller Bearings are built into a machine, you have the assurance that the bearing is planned, manufactured and applied for your specific requirements. Hyatt Engineering Service is at your disposal without cost or obligation. Address Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

throw). Single-pole switches have one, and two-pole switches have two, self-contained single-pole, double-throw units which are removable for replacement. Square D Co., Industrial Controller Div., 4041 No. Richards St., Milwaukee 12.

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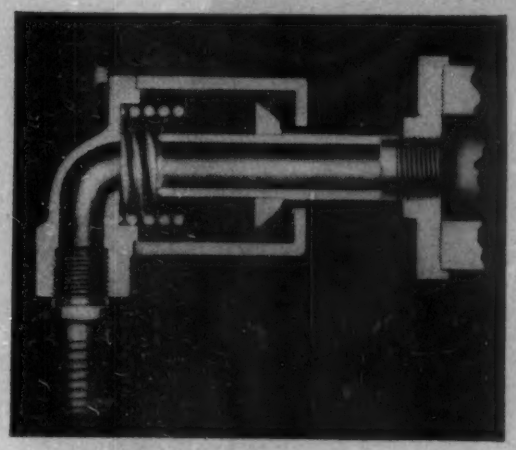


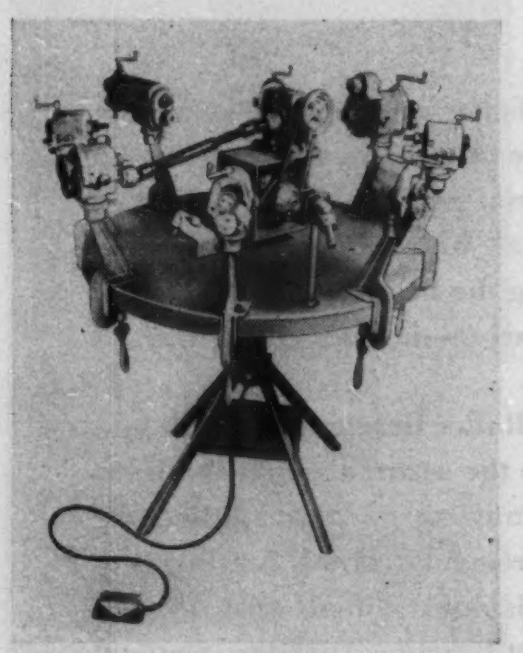
PRESSURE JOINT

Known as Type-S, rotary pressure joint may be used to admit heating or cooling agents to rotating rolls, particularly where considerable lateral movement of rolls is encountered, or where supports for a standard joint cannot be satisfactorily provided. It is self-lubricating, has no packing, and adjusts itself automatically for varying pressures. A large bearing or guide of carbon graphite fitted inside the body provides a bearing surface on the rotating nipple. The seal proper is effected between a hemispherical collar on the nipple and another carbon graphite bearing ring. Pressure itself is the sealing force; the higher the pressure the tighter the seal. Can be furnished to provide for syphon drainage pipes, to remove condensate through the same head that admits the steam. Four sizes: ½, ¾, 1, and 1¼ inch, all suitable for 150-lb. pressure, temperatures to 400 deg. F. Johnson Corp., Three Rivers, Mich.

•

WELDING EQUIPMENT

Manual equipment, called Lincolnweld, for hidden arc deep flux welding employing high current densities, is a portable unit for semi-automatic welding. It is said to provide all necessary welding current and auxiliary power plus the automatic wire feed mechanism and controls. The basic element of the unit is a standard 600-amp. welder, for straight manual welding as well as semi-automatic. Mounted on the welder is a container housing wire reel, feed mechanism, drive motor, and voltage controls. The aluminum cone-shaped welding gun, attached by a special cable, holds 3½ pounds of flux, dispensed by gravity through a heat-treated nozzle, which also carries the welding current to the wire and straightens the wire as it is fed through. A constant arc voltage is maintained by automatic controls. The Lincoln Electric Co., 12818 Coit Rd., Cleveland 1.



ROTATING POWER SOURCE

Designed to provide central power for a variety of hand-cranked tools and machines, the Roto-Table is a single-power unit 42 inches in diameter, which rotates around a central shaft to which is attached an electric motor-driven gearbox. A spring-loaded arm, with universal joints and sockets at each end, connects the drive unit with machines mounted around the rim of the table. Three speed ranges are provided through V-belts, and a foot switch controls both forward and reverse motion. Roto-Table Co., 2605 East 3rd St., Dayton 3.

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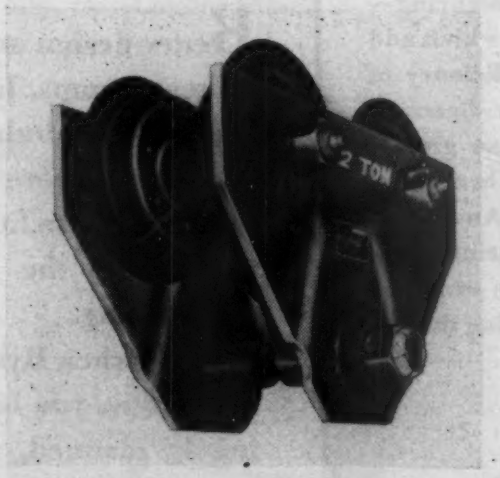


CHAIN HOIST TROLLEY

For use on I-beam overhead conveyor installations, chain hoist trolley has wheels fabricated of heavy carburized and hardened strip steel. "Grease-Seal" wheel design is said to hold lubricant, while excluding dust and grit. Standard grease fittings are supplied for positive pressure-gun lubrication. Deep flanges prevent wheels from climbing track, and heavy sideplates extend past wheels as bumpers. The two halves of the trolley are adjustable to permit mounting at any point on the I-beam, and spacing washers provide exact placement on I-beams from 3 to 18 inches. Saginaw Products Corp., 68 Williamson Rd., Saginaw, Mich.

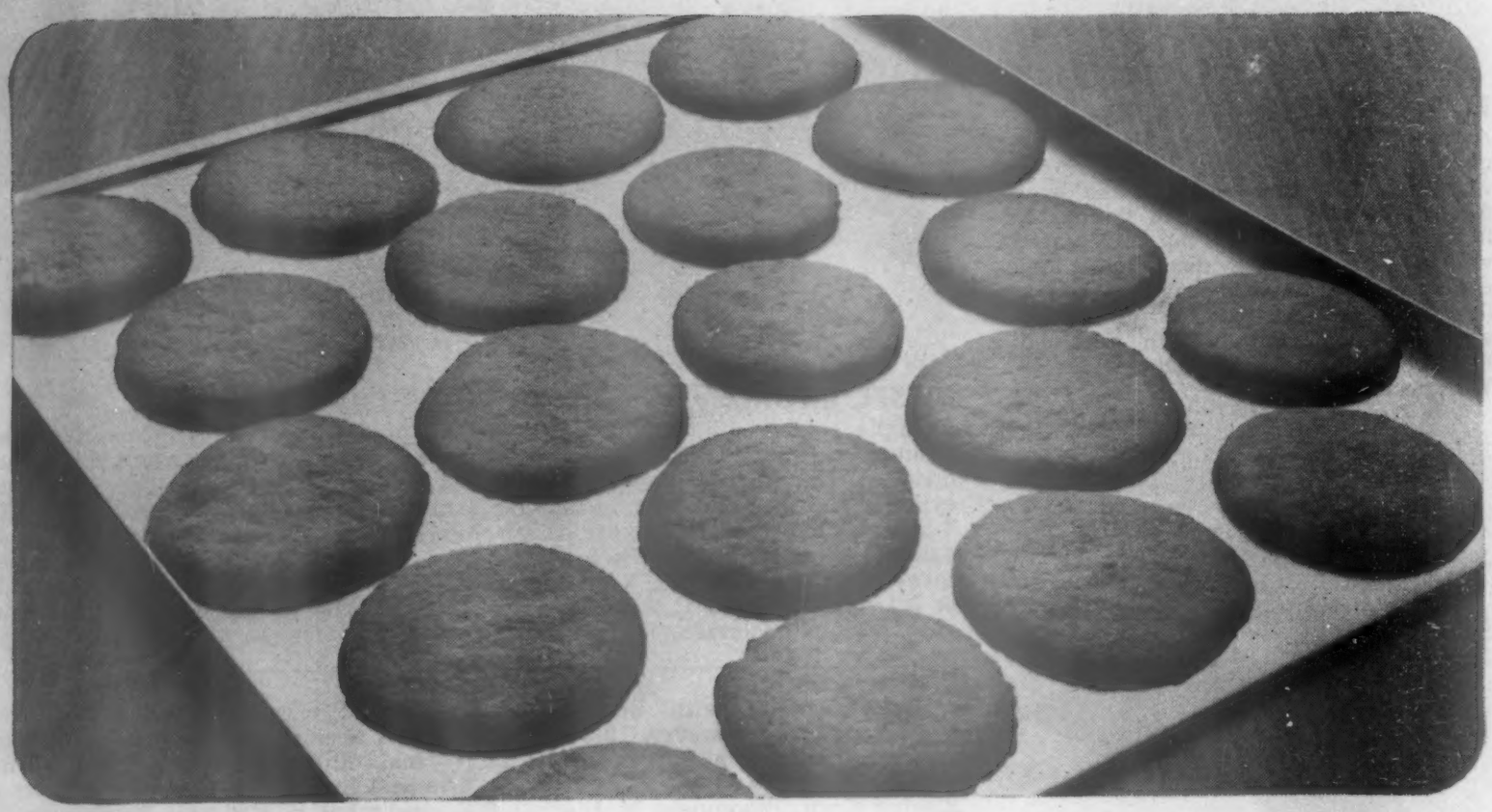
•

WATER COOLER

The water-cooled condensing unit and other operating parts of this electric drinking water cooler, known at Model OP-10W, are enclosed in a sealed, pressurized cabinet that protects them against corrosive fumes, lint, and dust. Cabinet is insulated to prevent formation of condensation, major cause of rust damage. Maker states that 10 gallons of

The first Rotary Positive Blower built by anyone was produced in the "Roots" plant in 1854—six years before the first pony express. We're not good because we're old, we're old because we're good!

GRANDMA LIVED 90 YEARS TOO SOON

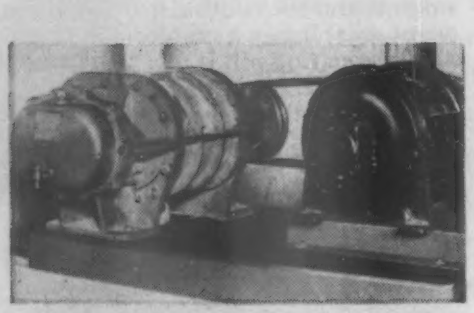


When she made those mouth-watering cookies, Grandma didn't have perfect baking temperatures, obtained from an even flow of gas. Even though "Roots" equipment was available almost 100 years ago, neither home nor commercial bakers had learned how to apply it to making cookies.

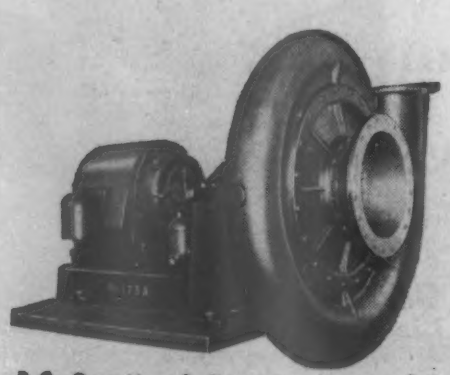
Now, it's different. Roots-Connersville Rotary Positive or Centrifugal Gas Pumps and Boosters help regulate gas and air supplies for every industry, where reliable performance is essential for profitable operations.

With our *dual-ability* to supply either *Centrifugal* or *Rotary Positive* equipment, we can match capacities, pressures and other factors to the job to be done . . . with complete impartiality. For any work of handling air or gas—ask R-C *dual-ability* to do the job faster, better, cheaper.

ROOTS-CONNERSVILLE BLOWER CORPORATION
806 Central Avenue, Connersville, Indiana



R-C Rotary Positive Blower built into modern gas-oven equipment to maintain constant, correct gas flow for even baking temperatures.



R-C Centrifugal Boosters insure deliveries of gas in sufficient quantities, at the right pressures for home, commercial and industrial users.

ROOTS-CONNERSVILLE
ROTARY CENTRIFUGAL
BLOWER BUILDERS · R-C · SINCE 1854
BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

properly cooled water an hour are available even in extremly hot locations. Ebco Mfg. Co., Columbus, Ohio.

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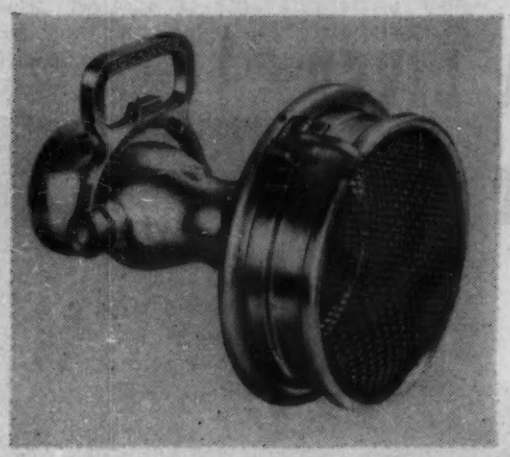

FOAM NOZZLE

Available for 1½-, 2½-, and 3½-in. hose, nozzle, called "FogFoam," is equipped with a screen that discharges a wide pattern of foam directly to flammable liquid fires. This screen can be replaced with a foam shaper to discharge a long range of solid foam stream. The foam liquid supply can be shut off and a high velocity waterfog pattern obtained. Rockwood Sprinkler Co., 38 Harlow St., Worchester 5, Mass.

•

ACID PAIL

Made of perforated steel with welded seams, 5-gal. pail is coated, inside and out, with rubber. Said to be unbreakable, the pail is designed for safe handling of acids and corrosive solutions. Its top is the same size as that of the 3-gal. size so that fluids will not splash or spill when carried. The bail or handle is rubber covered, a pouring lip is formed on the edge, and a tipping handle provided at the base. Automotive Rubber Co., Inc., 8601 Epworth Blvd., Detroit 4.

•

ULTRA-VIOLET LAMP

Twenty-five-watt lamp, called Slimline Germicidal Sterilamp, is designed for starterless operation with standard 64T6 Slimline fluorescent lamp auxiliaries. It operates in any position, and in temperatures as low as freezing, although optimum operation is at room temperature. As with all vapor lamps, the ultra-violet output decreases with the drop in temperature; however, blackening, which causes low output, is said to be negligible. Lamp Div., Westinghouse Electric Corp., Bloomfield, N. J.

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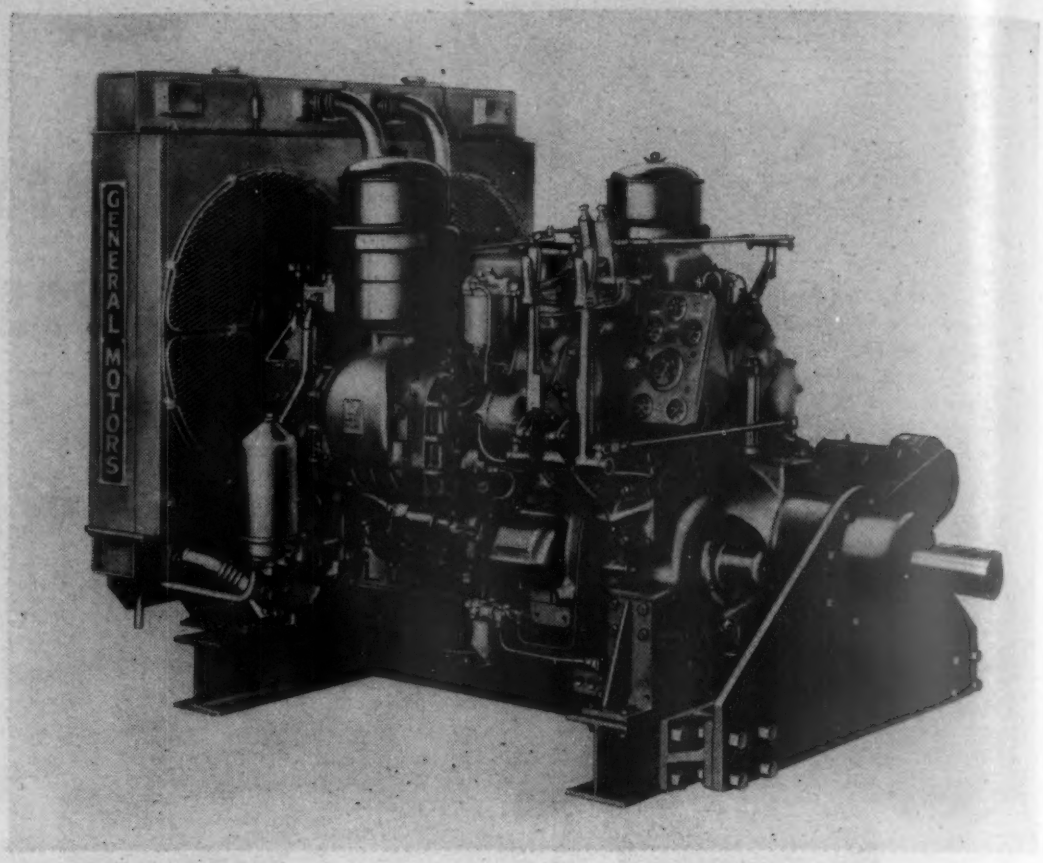
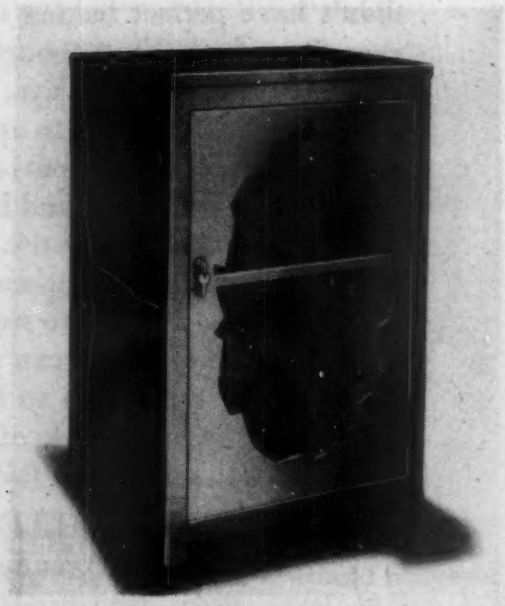


DIESEL ENGINE

Multiple engine unit, Model 8-103, consists of 2 GM Series 71 4-cylinder diesels mounted side by side on a common base, and geared to a single output shaft. The 170 continuous brake horsepower developed by this unit fills the gap between single 6-cylinder and Twin 6 models in the GM Series 71 line. Many components in the Twin 4 model, such as transfer gear cases, clutch and throttle controls, follow the same design as those standardized for other models in this series. Four different power take-off arrangements are available. Furnished with gear ratios of 1:1, 1.33:1, 1.76:1, or 2:1, with either right or left hand rotation. May be equipped with electric, air, or gasoline starting devices. Detroit Diesel Engine Div., General Motors Corp., Detroit 28.



OIL TESTER

Engine room equipment for examination of diesel lubricating oil is housed in a steel floor cabinet measuring 20x23x36 inches. The equipment includes gravity hydrometer and cylinder, viscosimeter, graduated centrifuge tube, miscellaneous liquids for testing, conversion tables, charts, and instructions for making each test The items selected are said to provide means for measuring the amount of the entire group of deterioration products responsible for all engine deposits; fuel dilution; water, dirt, scuff metal particles and acidity; also water and sediment in fuel and its gravity. Tests are made in one-half hour per week per engine, and the routine use of this equipment establishes a continuous record on the lubricating oil. It can also be used to forecast the need for preventive maintenance, particularly as regards fouling of injection nozzles as well as the gumming of piston rings. The Gerin Corp,. Red Bank, N. J.

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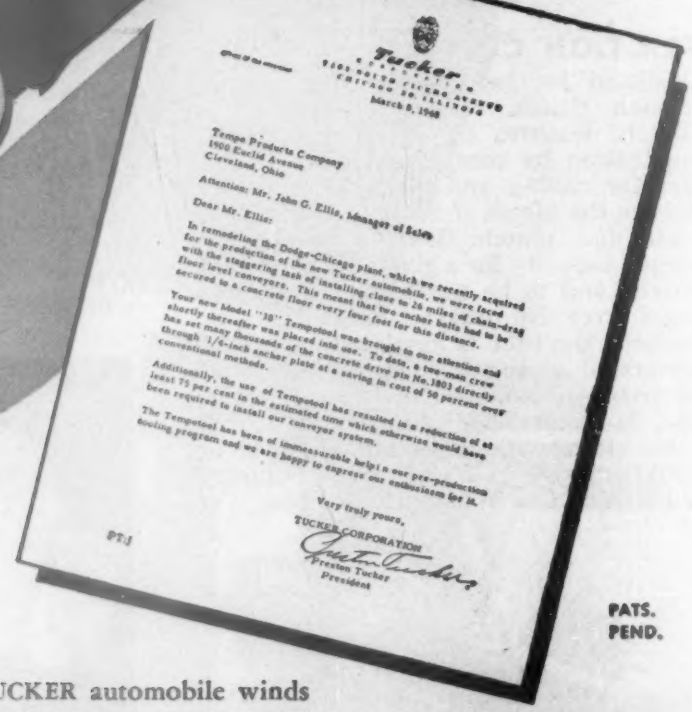
ELECTRIC TRACTOR

Lightweight electric tractor, Model A-560-5, for use where trailing loads are not severe, and floor and elevator capacities and operating space are limited, is 70 inches long (exclusive of coupler) and 34 inches wide. Weight of chassis without power source is 1450 pounds; light

TEMPOTOOL PAVES THE WAY...

for the exciting *New TUCKER!*


Tucker
9101 SOUTH STONY ISLAND AVENUE
CHICAGO 49, ILLINOIS
March 9, 1948
Tempo Products Company
1900 Euclid Avenue
Cleveland, Ohio
Attention: Mr. John G. Ellis, Manager of Sales
Dear Mr. Ellis:
In remodeling the Dodge-Chicago plant, which we recently acquired for the production of the new Tucker automobile, we were faced with the staggering task of installing close to 26 miles of chain-drag floor level conveyors. This meant that two anchor bolts had to be secured to a concrete floor every four feet for this distance.
Your new Model "38" Tempotool was brought to our attention and shortly thereafter was placed into use. To date, a two-man crew has set many thousands of the concrete drive pin No.1803 directly through 1/4-inch anchor plate at a saving in cost of 50 percent over conventional methods.
Additionally, the use of Tempotool has resulted in a reduction of at least 75 per cent in the estimated time which otherwise would have been required to install our conveyer system.
The Tempotool has been of immeasurable help in our pre-production tooling program and we are happy to express our enthusiasm for it.
Very truly yours,
TUCKER CORPORATION
Preston Tucker
President
PT:j

PATS. PEND.

● The production line for the brilliant new TUCKER automobile winds for almost twenty-six miles through their huge Chicago plant. A chain-drag conveyor had to be installed for this entire distance—anchored to the concrete floor every four feet. Faced with this stupendous task, TUCKER turned to the TEMPOTOOL method of fastening.

Using the "Model 38" and a two-man crew, they anchored ¼-inch steel cross plates directly to the concrete flooring with standard drive pins.

The company estimates that they saved *75 per cent* in time over conventional methods—and did the job for *half* the usual cost.

This is only one of many dramatic examples where TEMPOTOOL is saving time and money for users *every day*. For fast fastening—investigate TEMPOTOOL!

INVESTIGATE! SEND FOR THE NEW TEMPOTOOL BROCHURE *NOW!*

Tempotool Model "22" with Safety Shield

Tempotool Model "38" with Safety Shield

Distributed Nationally by

THE TEMPO PRODUCTS COMPANY

Dept. 315 • 1900 Euclid Avenue • Cleveland 15, Ohio

Manufactured by

STEMCO CORPORATION • Rocky River, Ohio

SOLD NATIONALLY THROUGH RECOGNIZED DISTRIBUTORS

FASTENS STEEL TO STEEL
FASTENS STEEL TO CONCRETE } *like that!*

running speed is 6.5 m.p.h.. Normal drawbar pull rating is 200 pounds with maximum drawbar pull of 1000 pounds, sufficient to move a trailing load of 25 tons on smooth, level surfaces. Standard power source is a low-type, 36-volt battery of 300-amp.-hour capacity. Mercury Mfg. Co., 4110 South Halstead St., Chicago 9.

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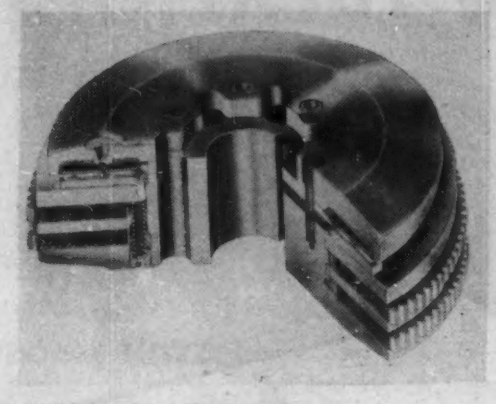

FRICTION CLUTCH

Designed for heavy-duty applications, friction clutch, called Air-Tube Disc Clutch, features direct axial pressure application by compressed air in a flat circular rubber and fabric air tube, to engage the plates of a single or multiple plate disc clutch. Said to have great torque capacity for a given diameter and length, and to be unaffected by centrifugal force. No packing, diaphragms, or gaskets; the tube is insulated from heat generated at the friction surfaces, and air passages cool the clutch. Available in 18-, 24-, and 30-in. single and double plate sizes, with capacities from 40 to 1000 horsepower. Wichita Falls Foundry & Machine Co., Wichita Falls, Tex.

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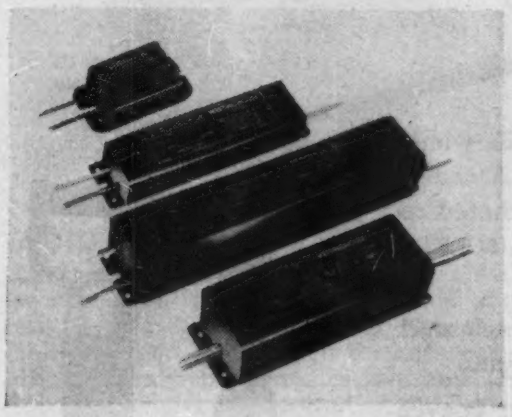

FLUORESCENT BALLASTS

Line of ballasts for all commonly used fluorescent lamps is available to meet usual applications as well as 50-cycle and special voltage sources. The silicon steel and compensator windings used in the ballasts are said to provide proper starting and long lamp life. Westinghouse Electric Corp., Box 868, Pittsburgh.

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WRENCH

Automatic self-adjusting and self-locking wrench, with ratchet action, is available in 6- and 8-in. sizes. The 8-in. size takes nuts from 7/16 to 15/16 inch. The jaws are made from chrome vanadium drop forged steel; the handle from alloy steel. Both are heat-treated for durability. E-Zee Tool Mfg. Co., 136 Liberty St., New York 6.

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SAFETY GOGGLE

Weighing less than 1 ounce, safety goggle has replaceable lenses made of 0.050-in. shatterproof clear plastic, which offer full eye protection against small flying particles, dust, and lint. Headband and noseband are adjustable, and eye frames ventilated. Manufacturer states that visibility is increased by the use of the curved aluminum frames. Advance Goggle Mfg. Co., 4551 West Diversey, Chicago 39

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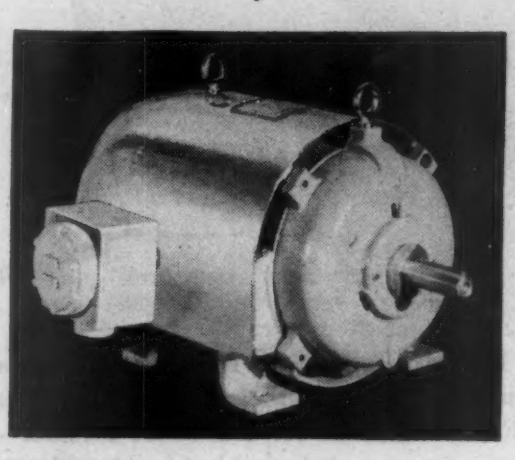

MOTOR

Corrosion-resisting explosion proof a.c. motor, for general use where chemicals are involved, is built to standards set by the Underwriters Laboratories for operation in locations where hazardous material, such as gasoline, oil, naphtha, is present. It is available in frame sizes 203 through 326 By the addition of a multi-conductor cable, rubber hose, and suitable packing glands, the motor also meets the specifications of the Bureau of Mines for use on "permissible" equipment. The Reliance Electric & Engineering Co., Cleveland.

•

RELIEF VALVES

Series of hydraulic and pneumatic relief valves is available in five pressure ranges: 0-15, 10-50, 40-125, 115-250, and 235-450 p.s.i. They are set by means of external adjustment to any operating pressure in the particular range involved. Adjustment is effected by positioning a threaded cap which determines spring pressure on the shutoff piston. The body and cap elements are available in aluminum or brass; the springs and metal-seat pistons are of stainless steel. The rubber seat piston is of brass. Full series of pressure ranges is available in each of six basic sizes, from ¼ to ¾ inch. Sizes 1 inch and larger, as well as pressure settings to 1000 p.s.i., are furnished on special order. The Parker Appliance Co., 17325 Euclid Ave., Cleveland 12.

•

PACKING

Chemically inert packing, in spools or rings, for packing valves, centrifugal and rotary shafts, reciprocating rods, and other points, is known as the Chemlon line. Made of flexible plastic, it is said to be unaffected by any solvent acid mixtures or acids or caustic solutions at temperatures to 690 deg. F. Its non-adhesive characteristics are claimed to minimize wear on reciprocating rods, shafts, and valve stems. Available in round cross-section braided spool form, ⅛- to 1-in. sizes, and for installations where endless rings can be installed. Style 772 contains no lubricant, and Style 776 impregnated with graphite. Crane Packing Co., 1800 Cuyler Ave., Chicago 13.

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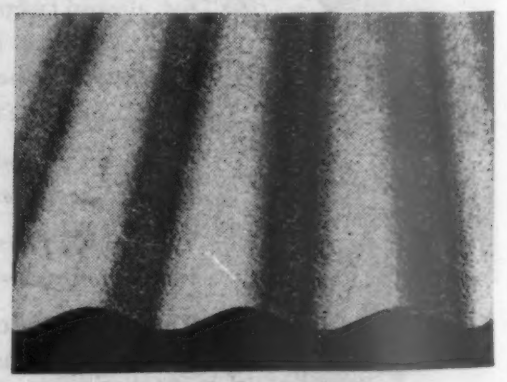


ALUMINUM SHEETING

Embossed aluminum sheeting, for roofing, siding, and similar structural uses, both interior and exterior, has standard lengthwise corrugations The embossed finish is said to have good nailing characteristics, and to reduce glare from the sun, as it reflects up to 95 per cent of the sun's rays. Available in 0.019- and 0.024-in. thicknesses, in a standard width of 26 inches, and in lengths of 6, 8, 10, and 12 feet. Produced in standard 1¼- and 2½-in. corrugations, and 5-V crimp roofing and siding. Reynolds Metals Co., 2500 South 3rd St., Louisville.

•

CHANGE IN NAME

The American Rolling Mill Company, Middletown, Ohio, has changed its name to Armco Steel Corporation. The change is one of name only, and no changes in

ONLY A MULTIPLEX SAW WILL DO THIS!

CUTS MADE ON ANY ANGLE - ANY POSITION

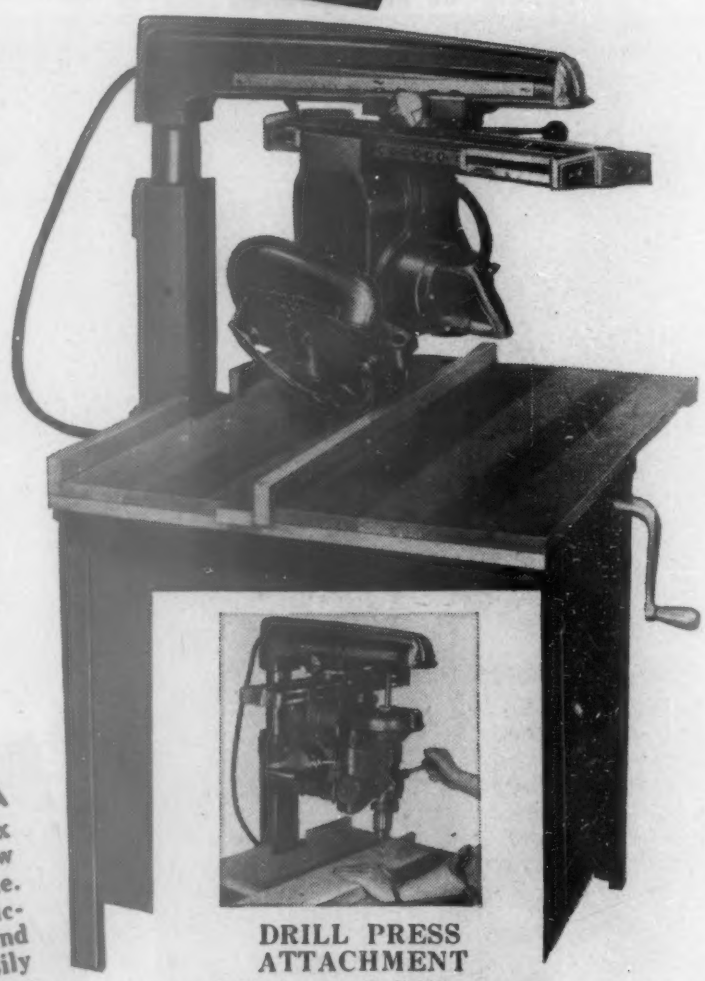
Here's complete 100% mitering capacity -- LEFT hand as well as conventional right hand miters from 0° to 90°. The EXCLUSIVE VERSATILE ELBOW, or center pivoted track, gives the Multiplex a great performance advantage over all other designs or makes, permitting an unlimited number of saw positions and operational cuts as well as unequaled ease of operation.

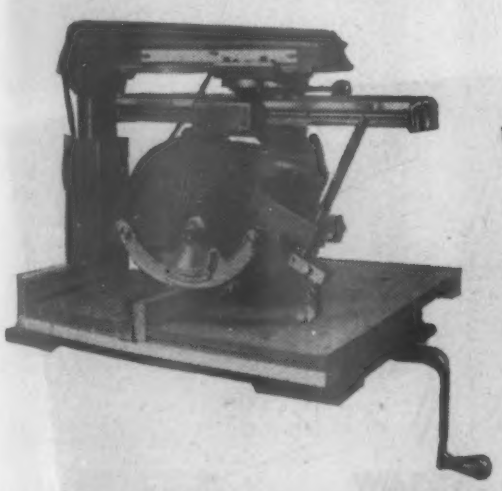
SOME OTHER VALUABLE MULTIPLEX FEATURES:

- **BALL BEARING TRACK ASSEMBLY - self cleaning ball bearings running on replaceable nitralloy rods.**
- **AUTOMATIC RECORDING RIP SCALES - provide accurate and convenient means of measuring width of rip. Easily legible and accurate miter and bevel scales.**
- **SELF-RETRACTING GUARD - adjusts itself to any position of the saw and provides extra safety and protection to the operator.**

If you want safer, more accurate, more economical woodworking production, investigate the Multiplex before you buy any radial arm saw.

Write for full information and name of nearest Multiplex dealer





MULTIPLEX MODEL 20A

Smallest of four Multiplex models. Brings you big saw performance at a popular price. Has the same sturdy construction and design features found in the larger models. Easily portable, compact - ideal where larger capacity saws are not required. Priced low enough to make even occasional use profitable. Write for complete information now.

DRILL PRESS ATTACHMENT

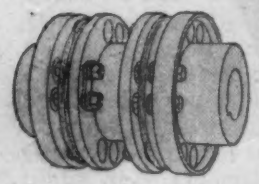
A high speed drill press is available for use on models 30-A and 40-A. Quickly attached. Provides unmatched operational scope.

MULTIPLEX RADIAL ARM SAWS

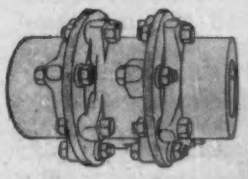
RED STAR PRODUCTS, INC., 3455 Vega Ave. Cleveland 13, Ohio, U.S.A.

THOMAS Flexible ALL METAL COUPLINGS

Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

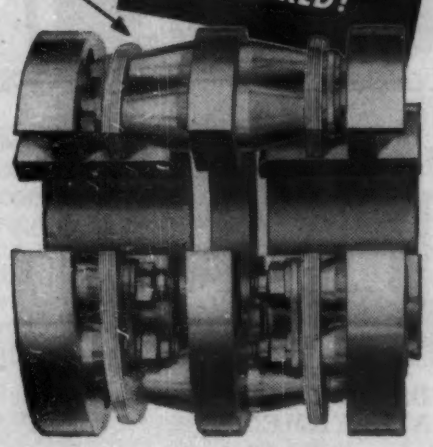


The standard line of Thomas Couplings meets practically all requirements. But if unusual conditions exist we are equipped to engineer and build special couplings.



BACKLASH FRICTION WEAR and CROSS-PULL are eliminated NO LUBRICATION REQUIRED!

PATENTED FLEXIBLE DISCS



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

Write for New Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

production, personnel, or policies are involved.

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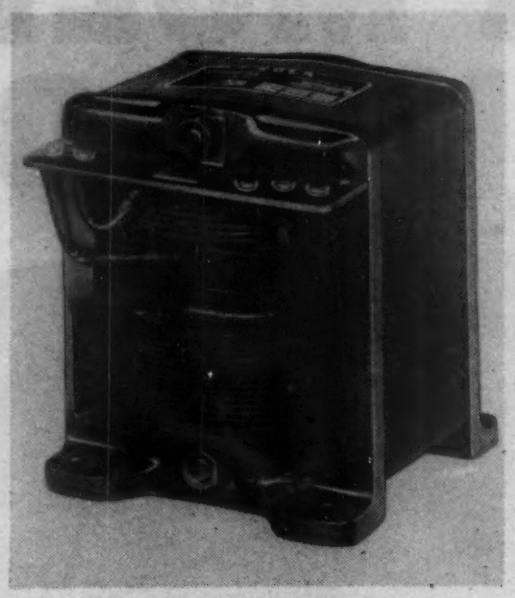

BALLAST TRANSFORMER

Type CVM-1 constant voltage ballast transformer is designed to protect and stabilize operation of mercury vapor lamps. According to the maker, operation of a lamp used in conjunction with this unit is free from effects of improper or widely varying voltage Unit is said to eliminate outages resulting from momentary voltage drops, and damage to lamp from improper selection of primary taps. Sola Electric Co., Claybourn Ave. & Terra Cotta, Chicago 14.

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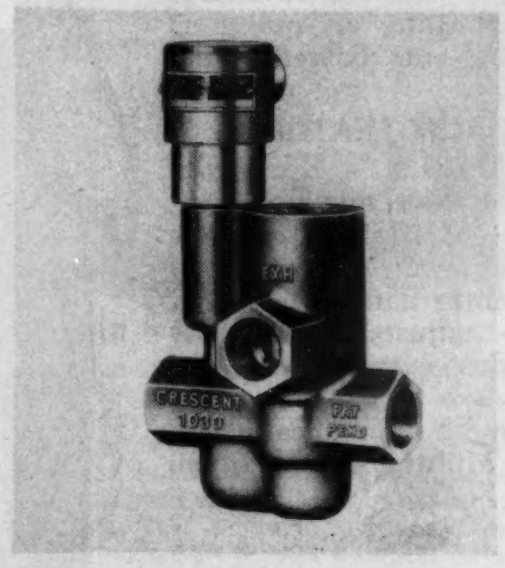

THREE-WAY VALVE

Pilot-actuated solenoid-controlled three-way valve is designed for use with air, water, and light oils. Designated Model 1030, valve functions at any speed of practical value, and is available for either normally open or normally closed operation. Suitable for pressures from 25 to 140 p.s.i., it may be converted to a straight-way shutoff valve by plugging the exhaust port. It mounts directly on pipeline, and may be completely disassembled without disconnecting piping. Supplied with small screw-in type solenoids for standard voltages, either a.c. or d.c. Crescent Valve Co., 6073 State St., Huntington Parke, Calif.

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CLEANING SOLUTION

Liquid formula, called Rotol, claimed to dissolve dirt and waste that accumulates on commutators, sliprings, contact tracks, controllers, and all forms of electrical contacts. It is nonflammable, and does not give off poisonous fumes. Maker states that it can be used without previous use of sandpaper or other abrasive. Rotol Chemical Co., 58-21 80th St., Elmhurst, L. I.

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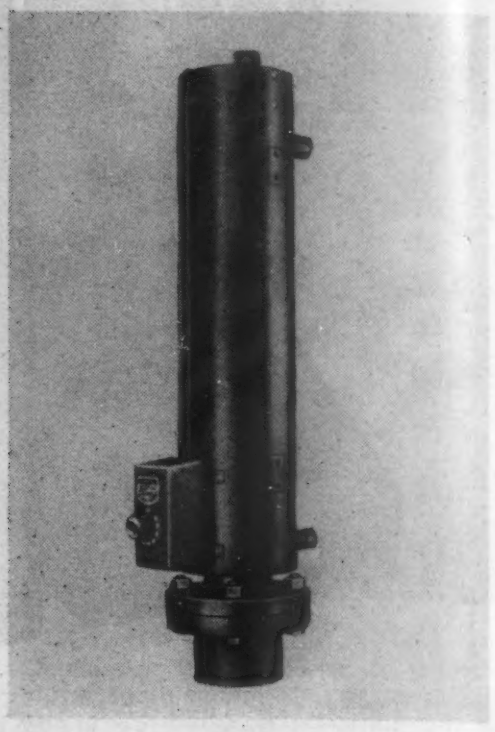


ELECTRIC HEATERS

Series of heavy-duty electric heaters, called Chromalox, is designed for superheating steam and preheating air and other gases used for processing, drying, vacuum packing, conditioning, and other applications requiring dry heat. Maker states that temperatures up to 750 deg. F. are rapidly reached and maintained by thermostatic controls. Three sizes are available—Series 2 with 2-in. standard pipe; Series 3 with 3-in. pipe, and Series 6 with 5-in. pipe. Capacities range from 1 to 12 kw. Two or more heaters may be connected in series for larger capacities. Standard range is 200 to 550 deg. F., and 100 to 1000 deg. F. Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8.

•

BANDSAW

All-purpose 14-in. bandsaw handles wood, metal, and plastics. All castings making up the saw are heat-treated before machining to relieve stress and distortion. The heavily ribbed 14x14-in. table surface is ground smooth and tilts

NOW you can insulate for good with Foamglas

● Many prominent concerns have deferred insulation programs until they could get PC Foamglas. Now—with our production doubled—all orders for Foamglas can be delivered promptly.

Foamglas is the only material of its kind. Big, rigid blocks are composed of millions of minute, closed, air-filled glass cells. Resistant to vapors, fumes and acid atmospheres—because it is glass—PC Foamglas retains its original insulating value *permanently* when installed according to our specifications and recommendations.

Review your insulation requirements as of today, for walls and ceilings, roofs and floors. If maintaining desired temperatures in your plant involves special problems, our technical staff will be glad to discuss them with you. Meanwhile you can get full information on customary uses of PC Foamglas from our recently published literature. Send the coupon for your free copies—today. Pittsburgh Corning Corporation also makes PC Glass Blocks.

When you insulate with FOAMGLAS . . . you insulate for good!

Photo, courtesy of Burkhardt Brewing Company, Akron, O. and Clemmer Construction Company, Akron, O., shows PC Foamglas being used in core wall construction, between outer brick wall and inner tile facing.

THE MAGNIFIED CROSS-SECTION

of PC Foamglas shows its cellular structure . . . glass bubbles solidified into big, strong, rigid blocks. In the millions of cells of glass-enclosed air, lies the secret of its insulating value.

PITTSBURGH PC CORNING ®

FOAMGLAS INSULATION

FOR ADDITIONAL INFORMATION SEE OUR INSERTS IN SWEET'S CATALOGS.

Pittsburgh Corning Corporation
Room 461-8, 632 Duquesne Way
Pittsburgh 22, Pa.

Please send me without obligation, your FREE booklets on the use of PC Foamglas insulation for:
Roofs_____ Walls_____ Floors_____

Name_____

Address_____

City_____ State_____

Half Truck

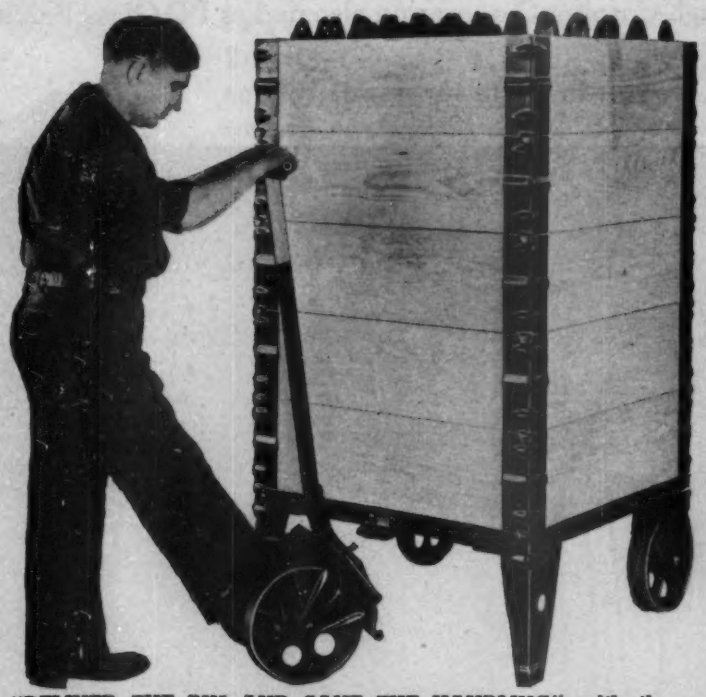
Half Platform

The **Transport**

has the Advantages of BOTH Truck and Platform
(the Disadvantages of Neither)

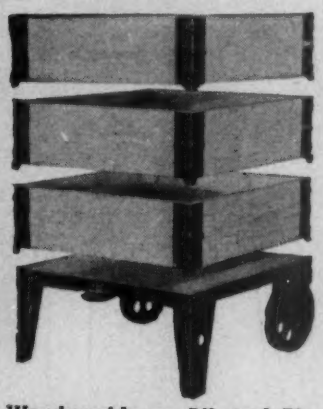
It is moved QUICKLY by Hand Jimmy
as well as by Power Lift Truck, Crane or Tractor
It is the Foundation Unit of

THE TURNER SYSTEM
OF MATERIALS HANDLING



"DELIVER THE BIN AND SAVE THE HANDLING" with the Hand Jimmy which works wonders on short hauls. For longer hauls the Transport is moved by power lift truck, crane or tractor.

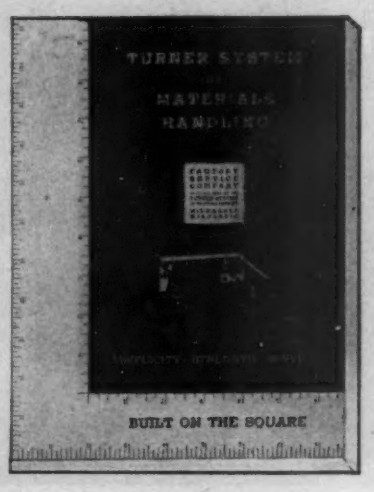
There's NO WAITING for lift trucks when you have Turner Transports. Time and labor saved on short hauls add up to long savings. A trial in your own plant will prove Turner System SAVINGS OF UP TO 50% in SPACE, LABOR and EQUIPMENT. Write for details of our Trial Offer!



Wooden-side or All-steel Bin Sections are added or removed as required. Racks, Trays and Die Tables also fit on the Transport.

Plants are kept in perfect order, yet materials are quickly movable with Shelf Racks on Transports.

This Book on the Turner System Sent FREE Upon Request



For more than a quarter of a century many of the leaders of American industry have benefited by the labor-saving ideas outlined in this book. It points the way to greater profit by reducing handling costs which run from 20% to 30% of each production dollar. Sent without charge — no salesman will call, except upon request. Write for copy today!

FACTORY SERVICE COMPANY
4605 NORTH TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

a full 45-deg. right and 15-deg. left angle. The wheels have neoprene tires, and each wheel is dynamically balanced. Foster Mfg. Co., 1 Kinsey Ave., Buffalo.

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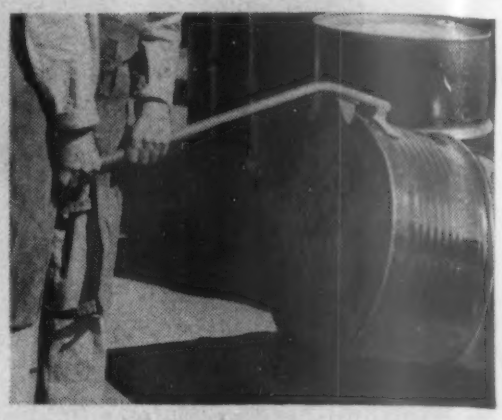

DRUM UPENDER

Designed to make it possible for one man to lift heavy drums without overstraining, drum upending bar, a solid steel tool, hooks firmly over and under the lip of the drum. When the bar is placed in position on the lip of the drum, the drum can be upended by steady pressure on the leverage handle. The 36-in. length of the bar keeps the man at a safe distance from the drum. Made of 1-in. steel, bar cannot bend or break, states manufacturer. The hooking part of the tool is designed to avoid possibility of damage to or denting of the lip or sides of the drum. Melooz Mfg. Co., 4730 Avalon Blvd., Los Angeles 11.

•

PNEUMATIC HAND TOOLS

Line of pneumatic tools, called Stream-Power, includes reversible drills and screwdrivers having up to ⅜-in. maximum drill and up to ¼-in. screwdriver capacities. Shears have up to 14-gage capacity, weight 5⅝ pounds, are 9½ inches long. Air wrenches handle 9/16-in. nuts, weigh 4 pounds, are 12 inches long. Can be used as a reversible wrench by changing adapter from one side to the other. Buckeye Tools Corp., 29 West Apple St., Dayton 1.

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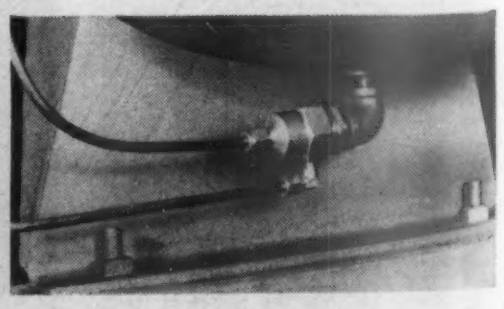

COMPRESSOR DRAIN

Automatic drain mechanism which removes water and oil from compressed air tanks is designed to fit any electrically operated air compressor equipped with a centrifugal or magnetic unloader. Wire mesh screen inserted ahead of the drain filters out particles of rust and

Announcing MEEHANITE *Centrifugal* CASTINGS

by Shenango-Penn®

Maybe this new combination is *your key* to big savings!

THE superior characteristics of Meehanite Metal castings are well known to most engineers and production officials. Likewise, many users of symmetrical machinery parts, in both ferrous and non-ferrous metals, know well the savings and distinct advantages afforded by the Shenango-Penn *centrifugal* process. *Now,* as a fully qualified manufacturer of Meehanite Castings, Shenango-Penn offers you an unequalled combination, Meehanite *centrifugal* Castings . . . rough, semi- or finish-machined as you wish.

So, if you want *stronger, pressure-dense* parts, with finer grain and extraordinary wear-resistance . . . if sand inclusions or blow holes now give you headaches . . . if you want to save metal and cut machining costs to the bone . . . then check into Meehanite Castings produced *centrifugally* by Shenango-Penn. Free bulletin No. 146 will give you some interesting facts to consider.

SHENANGO-PENN MOLD COMPANY
2876 WEST THIRD STREET • DOVER, OHIO
Executive Offices: Pittsburgh, Pa.

SHENANGO-PENN

ALL BRONZES • MONEL METAL
NI-RESIST • MEEHANITE METAL

How to Save five ways on Packaging

Read how Acme Steelstrap enabled maker of aluminum garage doors to save materials, labor, freight costs, inventory, and damage claims

FIVE-WAY SAVING IN ACTION. Acme methods and tools and Acme Steelstrap make this package of four aluminum garage doors "Bound to Get There."

Tubular Aircraft Products Company, Los Angeles, make these popular aluminum garage doors.

Management considered their previous method of packaging too slow and expensive.

After consulting with an Acme Shipping Specialist, the company adapted Acme methods to bring about this 5-way saving:

1 **Acme Steelstrapped telescope corrugated containers bring a saving in *materials*.**

2 **Packaging is easier and *four times faster* for big saving in *labor*.**

3 **Reduction in package weight means saving in *freight charges*.**

4 **Same precut corrugated board used in carton will package one to four-door shipments for reduction in package materials *inventory*.**

5 **Package and doors reach customers clean, good-looking, undamaged for reduction in *damage claims*.**

For details on how we have helped many other companies get comparable savings—and how we can work with you—just clip and mail the coupon for the new free booklet, "SAVINGS IN SHIPPING."

STRAPPING DIVISION
ACME STEEL COMPANY

Acme Steel Company, Dept. FM -68
2838 Archer Avenue, Chicago 8, Illinois

Please send me a copy of your case history booklet, "SAVINGS IN SHIPPING."

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Company_____

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City_____ Zone____ State_____

Doc. Steelstrap ®

Acme Steelstrap — ACME STEEL CO. CHICAGO

NEW YORK 17 ATLANTA CHICAGO 8 LOS ANGELES 11

dirt, preventing possible damage to the drain mechanism. A Shelburn Co., 739 Ceres Ave., Los Angeles 21.

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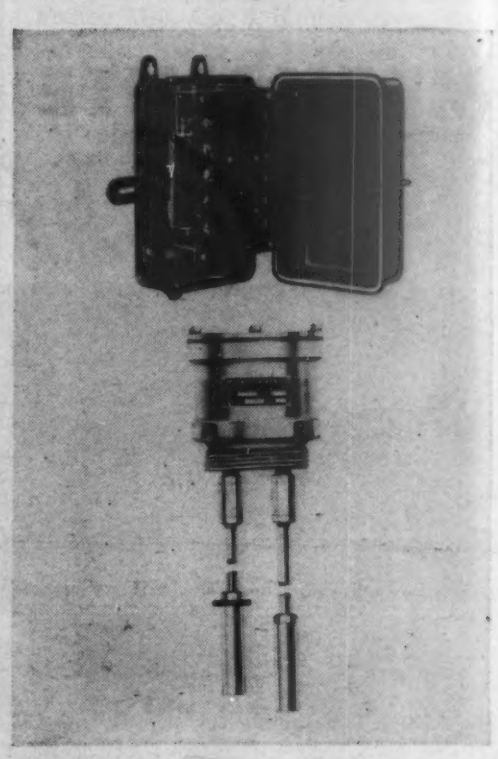

LEVEL CONTROL

Type 10CB1 level control is designed to control the level of practically all electrically conductive liquids. It consists of an electric relay operating from a probe circuit through a transformer and rectifier. The probe circuit may be set at several different senstitivites, and will discriminate between a liquid and its foam. Manufacturer states that it is not affected by the saturated vapor above a liquid in a closed tank, permitting positive control of acid in batch processing. It is a floatless level control, and operates with low voltage in the probe circuit. Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

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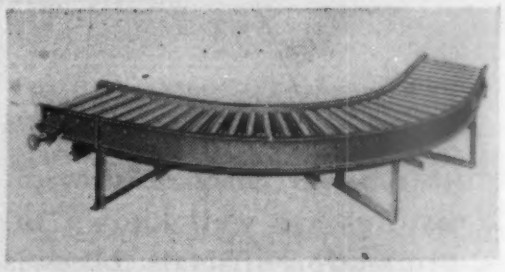

CONVEYOR SECTIONS

Roller conveyor curve sections are driven either from an adjacent conveyor or by an independent motor, through chain or sprocket, to a heavy-duty V-belt. The V-belt rides in sheaves mounted to guide the belt around the arc of the curve. The sheaves, ball bearing, are intermittently spaced below the belt, and are provided with vertical adjustment to maintain pressure against the load roller. Tension of the belt may be adjusted according to need. The Alvey-Ferguson Co., Dept. F., Cincinnati 9.

•

CLEANING SOLUTIONS

Solutions for cleaning small metal pieces or parts of meters, gages, and other intricate instruments remove grime, grease, and oil, and brighten the parts, according to manufacturer. Solutions are safe to use, having a flash point well above 100 deg. F., and are nontoxic. The No. 1 Foamless solution is

"FUSTEST WITH THE MOSTEST!"

GL-3C23
(1.5 amp)

GL-5560/FG-95
(2.5 amp)

FG-105
(6.4 amp)

They're winning words industrially, as in war. When you buy electronic control tubes, bear in mind that (1) G.E. built thyratrons first, (2) G.E. builds the most thyratrons.

SO MUCH of your modern plant equipment is electronically controlled—the d-c motors that drive your lathes, millers, borers, grinders; your resistance-welding apparatus; your automatic counters and sorters—that new *thyratron tubes* for replacement are a purchase item of vital importance.

The thyratron is a General Electric "first". No product represents more intensive development, more continuous improvement than this lightning-fast G-E control tube. Internal parts are strongly braced to withstand shock and vibration, for G-E thyratrons are *sturdy!* Grids are placed to minimize any risk of damage from current surges. The base and lead connections are solidly fastened, will not loosen in service.

G-E thyratrons operate cooler! Their parts are generously dimensioned to give an ample temperature margin of safety. Exhaustive pre-testing—as many as 106 test and inspection steps for a typical thyratron!—safeguards rated performance.

Solidly covered by G-E warranty, locally available in a wide range of service-proved types, G-E thyratrons will be at your door soon after you phone your G-E tube distributor or dealer. Let him know your needs today! *Electronics Department, General Electric Company, Schenectady 5, New York.*

Distributors and dealers from coast to coast offer **SAME-DAY DELIVERY SERVICE** *on G-E electronic tubes.*

GENERAL ELECTRIC

161-GA29-8850

FIRST AND GREATEST NAME IN ELECTRONICS

Safe Footing

No doubt about it! That's what you get when you install Inland 4-Way Floor Plate in your plant. This modern skid-resistant flooring, with its 4-way safety lug pattern, provides built-in protection and economy wherever feet or equipment must go . . . floors, walkways, ramps, platforms, steps. INLAND STEEL CO., 38 S. Dearborn St., Chicago, Ill. Sales Offices: Chicago, Davenport, Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, and St. Paul.

WRITE FOR BOOKLET

INLAND

Stocked by Leading Steel Warehouses

4-WAY FLOOR PLATE

designed for cleaning operations where mechanical means are used, such as swirling the parts in solution; No. 1 Regular, as well as the Concentrate, may be used in a cleaning machine, but is designed for hand operations; Nos. 2 and 3 Rinsing Solution are used to remove the Foamless, No. 1 Regular, or Concentrate from the parts, and leave no residue or spotting. Zenith Mfg. & Chemical Corp., 52 Beekman St., New York 7.

•

BANDSAW

Small horizontal bandsaw is designed for use on metals up to 5x10 inches. It has a rigid box-type frame with the wheel assemblies mounted high on welded steel brackets bolted onto the frame. Bed is 7 inches wide by 28 inches long, set on a three-point base. Hydraulic control is built into the machine to give correct feed for every section, and a stock stop gage is supplied for duplicate cutting. Machine operates and shuts off automatically. Three blade speeds are available, 45, 90, and 150 f.p.m. Machine is portable, weighing 235 pounds. Johnson Mfg. Corp., Room 614, Chrysler Bldg., New York 17.

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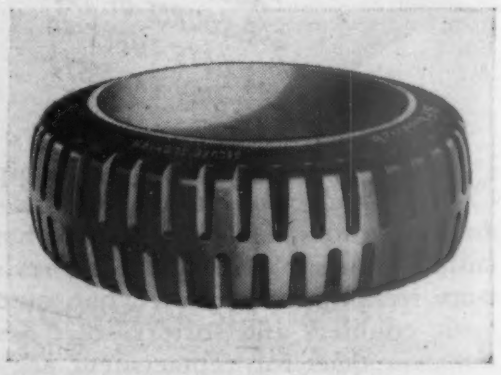

RUBBER TIRE

Pressed-on industrial rubber tire, called the DeLuxe Cushion, is designed to meet operating requirements of power-driven industrial trucks and tractors. Made with both smooth and non-skid tread, it is constructed of a resilient rubber compound which is said to offer resistance to cutting and chipping. The B. F. Goodrich Co., Akron.

•

WIRE MESH PANELS

Panels, of standard or heavy-duty wire mesh, are suitable for making rooms, partitions for storage, toolrooms, shop offices, or for protection against unauthorized intrusion. Interchangeable panels allow forming a corner at any panel intersection, or location of a door between sections. Non-telescoping 1¼-in. line posts replace and are interchangeable with previously used 1-in. channel. Available in panels 7, 8, 9, and

HYSTER "40"

CURRENT DELIVERY TO MANUFACTURING INDUSTRIES

4000-lb. capacity... Pneumatic tires... 42 inches wide... Hydraulic brakes and lift ... Maneuverability... Low operating cost.

This all-purpose Hyster fork lift truck is what production cost-minded plant managers need... Pneumatic tires for indoors *and* outdoors work, on smooth *or* rough surfaces... 2-ton capacity for hoisting, transporting, tiering... Maximum visibility... Solves 7 out of 10 materials handling problems... Costs only 93c an hour to own and operate.

Your Hyster sales and service distributor is listed in the telephone book classified section under Industrial Trucks. Phone him or write for literature.

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ALASKA—Northern Commercial Co.
BIRMINGHAM, ALA.
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BROOKLYN, N. Y.—A. S. Rampell
BUFFALO, N. Y.—Rapids Handling Equipment Co. of Buffalo, Inc.
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A. R. Williams Machy. Western, Ltd.
CHATTANOOGA, TENN.—Embry Brothers, Inc.
CHICAGO, ILL.—Hyster Company
CINCINNATI, O.—Oral T. Carter & Associates
CLEVELAND, O.—Morrison Company
DALLAS, TEX.—C. H. Collier Company
DENVER, COLO.—Paul Fitzgerald
DETROIT, MICH.—Bentley & Hyde
GRAND RAPIDS, MICH.—Bentley & Hyde
HALIFAX, NOVA SCOTIA
A. R. Williams Machy. Co., Ltd.
HONOLULU, T. H.—Electric Steel Foundry Co.
HOUSTON, TEXAS—C. H. Collier Company
INDIANAPOLIS, IND.
Central Rubber & Supply Co.
JACKSONVILLE, FLA.
L. S. Teague Equipment Co.
KANSAS CITY, MO.
Industrial Power Equipment Co.
LOS ANGELES, CALIF.—Hyster Company
LOUISVILLE, KY.—Embry Brothers, Inc.
MEMPHIS, TENN.
Hyster Co. of Louisiana, Inc.
MILWAUKEE, WIS.—Hyster Company
MINNEAPOLIS, MINN.—W. S. Nott Company
MOBILE, ALA.—S & T Equipment Co., Inc.
MONTREAL, P. Q.
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NEW ORLEANS, LA.
Hyster Company of Louisiana, Inc.
NEW ROCHELLE, N. Y.
Eastern Industrial Sales Co.
OTTAWA, ONT.
A. R. Williams Machy. Co., Ltd.
PHILADELPHIA, PA.—Rapids Handling Equipment Co. of Phila., Inc.
PHOENIX, ARIZ.—Equipment Sales Company
PITTSBURGH, PA.—Equipco Sales Company
PORTLAND, ORE.—Hyster Sales Company
RICHMOND, VA.—Richmond Auto Parts, Inc.
ROCHESTER, N.Y.—Rapids Handling Equipment Co. of Buffalo, Inc.
ST. JOHNS, N. F.—City Service Company, Ltd.
ST. LOUIS, MO.—Wharton L. Peters, Inc.
SALT LAKE CITY, UTAH
Arnold Machinery Company
SAN FRANCISCO, CALIF.—Hyster Company
SEATTLE, WASH.—Hyster Company
TORONTO, ONT.
A. R. Williams Machy. Co., Ltd.
VANCOUVER, B.C.
A. R. Williams Machy. Western, Ltd.
VICTORIA, B.C.
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A DOOR IS ONLY AS GOOD AS IT OPERATES

SEE OUR CATALOG IN SWEET'S

What you want most in a door is easy, dependable operation—all day, every day—to keep traffic flowing in and out and merchandise on the move.

You want a door that spends a minimum of time waiting for the service man to arrive so it can get going again. Nothing's more useless than a door that isn't working! And, for that reason, you want a door that's backed by dependable service, day and night, week-ends and holidays, too.

For nearly 20 years Crawford dealers have been building business on that kind of door and that kind of service. All our dealers specialize in service on *any* make of door and many carry stocks of the most frequently needed replacement parts.

Next time your doors, regardless of make, need service, call the Crawford man listed under CRAWFORD DOOR SALES CO. in the Yellow Pages of your phone book. He'll get on the job—fast!

He'll be glad to tell you, too, about Crawford Doors, power operators, remote controls, and the energized "MARVEL-LIFT" which operates so easily that Crawford Doors up to 14′ x 14′ can be operated by hand.

A pleasure to send you literature on request.

Crawford DOOR CO.

409 St. Jean • Detroit 14, Michigan

10 feet high, 5 feet wide. Other sizes furnished on order. Acorn Wire & Iron Works, 5912 Lowe Ave., Chicago 21.

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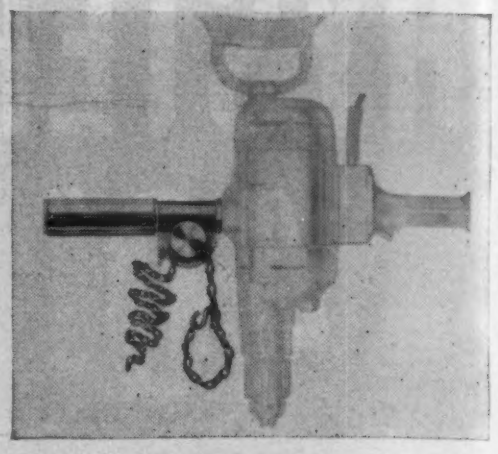

PRESSURE HANDLE

For use with a portable electric or pneumatic drill, pressure handle feeds the drill into the work. One end of the feed chain is fastened to the work, the other placed over the chain sprocket on the pressure handle. A slight twisting pressure on the handle turns a worm gear which rotates the sprocket and creates a pulling force on the chain. Although this force is not centered, and has a slight tendency to pull the drill to one side, a minimum of effort is required to counteract this pull and hold the drill centered, according to manufacturer. Pressure Handle Co., North State St., Wilkes-Barre, Pa.

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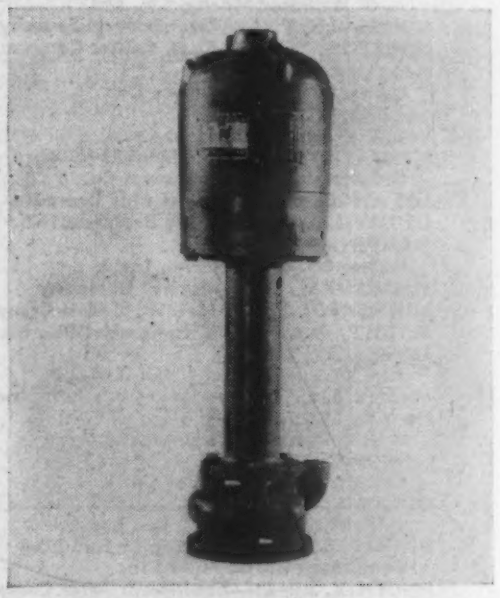


COOLANT PUMPS

Two sealless-type coolant pumps, the KF type, a vertical submerged, and model KW, a sidewall-mounted unit, are designed for general circulation duty and machine tool applications. They are of the low-head, single-stage types, close-coupled to the motor. The double suction, open-impeller, submerged type, constructed for vertical operation with flooded suction at all times, is suitable for handling liquids containing considerable amounts of solids, chips or suspended abrasive particles. The sidewall-mounted unit is available with adapters of two different lengths, depending on the depth of the coolant reservoir. Allis-Chalmers, Box 512, Milwaukee 1.

•

GREASE FITTINGS

The ball-in-head design of bullneck-type grease fittings, called Kleenseal, is said to keep dirt out, grease in. Head

FRIGIDAIRE your first choice in AIR CONDITIONING

First choice because . . .

Frigidaire offers a full line of air conditioning: self-contained store conditioners, large-capacity central systems, window-type room conditioners.

First choice because . . .

Frigidaire is a pioneer name in air conditioning and refrigeration . . . stands for the finest in engineering, in precision manufacture. You're sure of getting the very latest and best equipment when you specify Frigidaire.

First choice because . . .

Frigidaire's nationwide organization is factory-trained, is located to serve you promptly and efficiently, wherever you are.

Frigidaire Store Air Conditioner

Cools, dehumidifies, filters, circulates, ventilates in summer; heating coil may be added for winter.

Compact, quiet, attractive—may be installed right in the space to be air conditioned. Completely self-contained. May be installed in series for large areas, or used with simple duct system if desired.

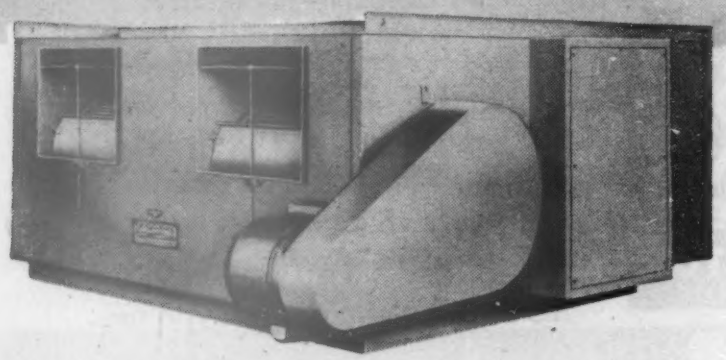
Ideal for leased premises: requires no extensive building alterations, easily moved.

Air conditioning "as you like it." Concealed, easy-to-adjust temperature control; air distribution grilles.

Compressor made by world's leading manufacturer of mechanical cooling equipment—Frigidaire!

You're twice as sure with two great names

FRIGIDAIRE made only by **GENERAL MOTORS**



Frigidaire Central System Air Conditioners

Frigidaire offers products in capacities, types and sizes for every need. These can be combined in a wide variety of ways to answer almost any air conditioning problem. They cool, filter, ventilate, circulate and dehumidify in summer; heating coils can be added for winter.

For PRODUCTS you can depend on . . . a NAME you can depend on . . . a DEALER you can depend on—*Call in Frigidaire!* Find Frigidaire Dealer's Name in Classified Phone Directory. Or write Frigidaire, Dayton 1, Ohio. Leaside 12, Ontario.

METER-MISER AND RECIPROCATING TYPE COMPRESSORS
REACH-IN REFRIGERATORS • HOME AND FARM FREEZERS
BEVERAGE, WATER AND MILK COOLERS • DISPLAY CASES
ELECTRICAL APPLIANCES FOR THE HOME

NEW!
Rotol
CLEANS–PRESERVES–POLISHES
All Forms of Electrical Contacts!

Rotol SAVES TIME

A revolutionary liquid formula that in one application cleans, preserves and polishes commutators, slip rings, contact tracks, controllers, starters and regulators, relays, cell switches, and all forms of electrical contacts.

Rotol SAVES WORK

ROTOL thoroughly and safely dissolves dirt and waste.

ROTOL is SAFE. It is NON-INFLAMMABLE. It does not give off any poisonous fumes!

ROTOL is self-sufficient. No sandpaper or other abrasive necessary.

Rotol SAVES THE MOTOR

ROTOL leaves no residue or film, yet retains on commutator the rich brown color that assures good friction.

ROTOL helps maintain maximum efficiency of motor.

ROTOL is clean and easy to use. Acts quickly. Full directions with every can.

ROTOL is economical. A small quantity cleans a large motor.

$1.10 PER PT. CAN.

FREE: A sample bottle of ROTOL on request!

Rotol CHEMICAL CO., 58-21 80th ST., ELMHURST, L. I., N. Y.

can be wiped clean. The fittings are made with enlarged neck size and projecting locking pad; spring is designed so that it will not compress to restrict flow of heaviest lubricants. Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis

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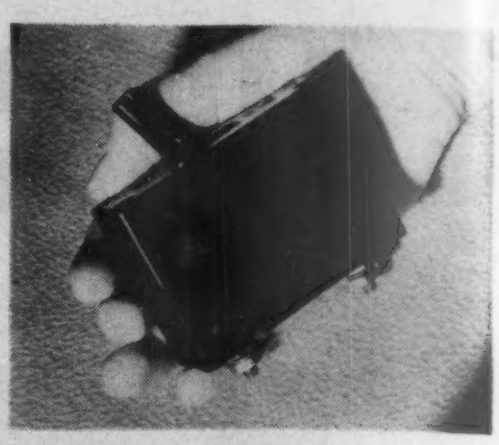

CIRCUIT BREAKER

Palm-sized circuit breaker that will interrupt 5000 amperes at 125 volts a.c. and withstand a mechanical impact up to approximately 150 foot-pounds is designed for use wherever vibration is prevalent. Damping by a bimetal overload element accounts for the breaker's ability to withstand high mechanical impacts. The overcenter principle is used in the circuit breaker mechanism, together with contacts of special alloy, and a "De-ion" arc extinguisher. Breaker is arranged for front-of-panel or rear-of-panel mounting. Westinghouse Electric Corp., 306 4th Ave., Pittsburgh 30

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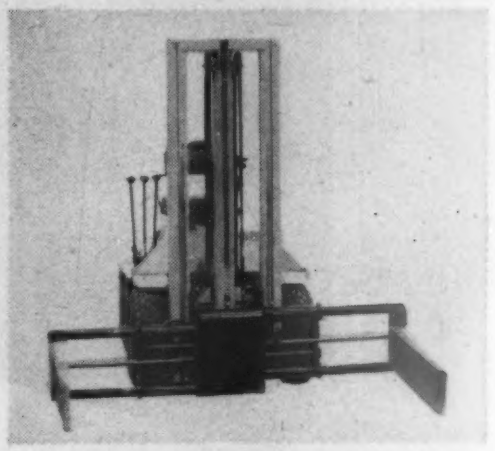

MATERIALS HANDLING ATTACHMENT

For palletless materials handling, "Load-Grab" is designed for use with manufacturer's models 20 and 40 lift trucks. Arms of grab "squeeze-grip" bales, boxes, drums, or barrels. Capacity of Model 20 attachment is 1780 pounds; of model 40, 3350 pounds. The steel arms are operated and hydraulically controlled from a lever at the driver's right. They spread from a minimum 17 inches to a maximum 62 inches on model 20 and 66 inches on model 40 and can be lowered to within 6 inches of the floor. Hyster Co., 2902-58 North East Clackamas St., Portland 8, Ore.

•

LADDER

Lightweight aluminum ladder is built with safety ridges on the extruded aluminum steps to prevent slipping. Legs are girder shape, riveted so that the more weight applied, the more rigid the ladder becomes. Rubber guards on the feet of the ladder protect floors and eliminate slipping. Work shelf and top step are

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GENUINE *Jeffrey* REPLACEMENT PARTS

Eliminate costly shutdowns with genuine Jeffrey Replacement Parts. They fit exactly because they are made to the same specifications as the original part. They can be installed in a minimum of time. They'll last longer, too, because Jeffrey engineers and metallurgists often add improvements to the already high standards of original parts.

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Complete Line of Material Handling, Processing and Mining Equipment

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Baltimore 1	Buffalo 2	Cleveland 13	Harlan	Jacksonville	Pittsburgh 22
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				Philadelphia 3	Scranton 3

6 reasons why

WIDE BASE

GENERAL INDUSTRIAL PNEUMATICS

move loads faster, cheaper

SEE THE REASON

General Industrial Tire 16" overall diameter, mounted on wide base rim.
5.03" SEC. DIA
4¼" RIM
Conventional Tire 16" overall diameter mounted on narrow base rim.
4.02" SEC. DIA
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Bigger Air Volume makes the difference

Since General Industrial Tires, mounted on General's exclusive wide-base rims, give you a greater volume of air per tire... you can carry a greater load at the same pressure or the same load at lower pressure.

1 **CARRY HEAVIER LOADS**—Greater air volume permits larger loads without damage to floors or tires.

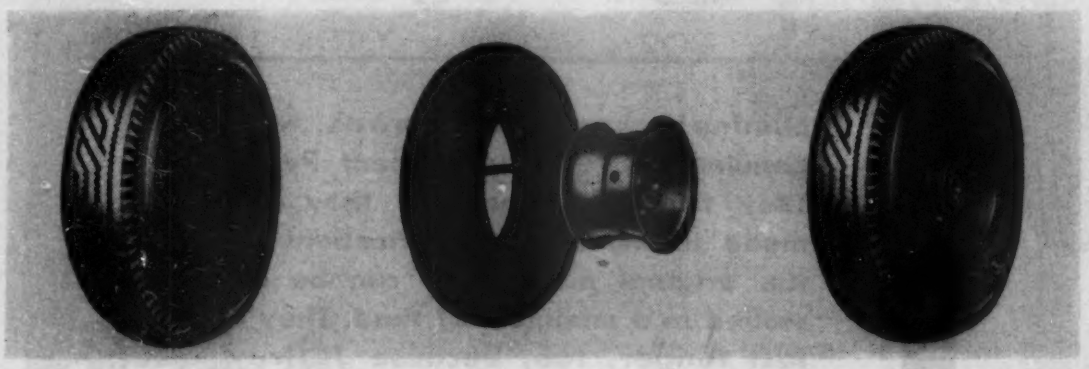
2 **CUSHION THE LOAD**—Lower air pressure provides a softer ride, reduces breakage and spillage.

3 **EASIER TO CHANGE**—Tires can be changed in a few minutes. Money saved on labor is money in your pocket.

4 **RUN BETTER AT HIGHER SPEEDS**—Wide-base rims give greater stability, less sway, better stopping.

5 **LAST LONGER**—Built on the same machines, and of the same Top Quality materials as famous General Truck Tires.

6 **REDUCE WORKER'S FATIGUE**—Trucks on Generals move easier, with less effort, less energy or less fuel. Jolts and jars are reduced to a minimum.



COMPLETE FACTORY ASSEMBLED UNITS

You can order General Industrial Pneumatics in complete units of tire, tube and wheel all inflated and ready for installation.

Size for size, these mighty midgets of the General Tire line, match their "big brothers" in strength, long wear and all around, money saving ruggedness. Try them. You'll find you can rely upon them.

New brochure tells how to move loads and mobile equipment cheaper and faster. Write Dept. 9, The General Tire & Rubber Co., Akron, Ohio.

THE GENERAL TIRE & RUBBER CO.
AKRON, OHIO

The GENERAL TIRE

covered with heavy rubber matting. Load capacity said to be over 500 pounds per step, or total working load of over 1000 pounds. Available in 2-, 3-, 4-, 5-, and 6-ft. lengths. Bardwell & McAlister, Inc., 2950 Ontario St., Burbank, Calif.

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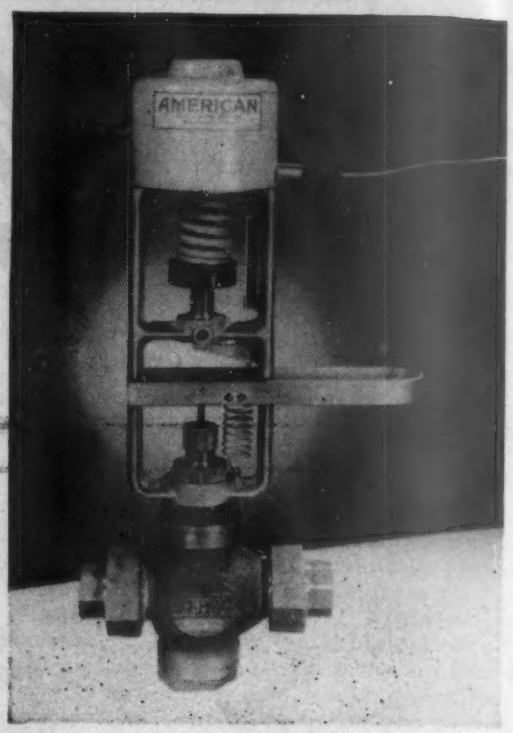

TEMPERATURE REGULATOR

Snap-action temperature limiting regulator is designed for use on processing machinery where a positive shutoff is required when the critical temperature has been reached. Accuracy of actuation is obtained by use of ground and fitted stainless steel parts. Regulator may be manually reset by raising the "cocking" lever. Made in 3 sizes, ½, ¾, and 1 inch, and for temperatures from 20 to 345 deg. F. Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

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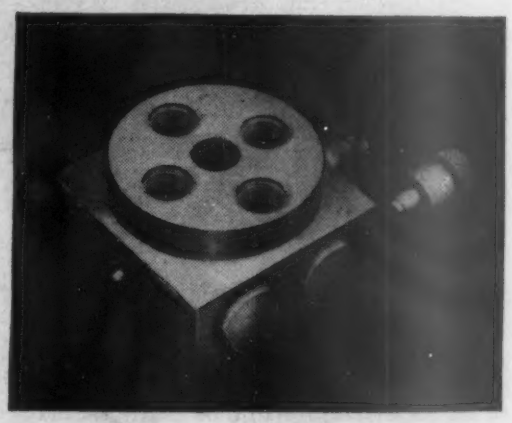

VALVE

Four-way selector valve, for controlling flow to remote actuating cylinders of hydraulic systems, has an aluminum alloy body, with four line connections. It includes a group of conventional, spring-loaded, balanced-type poppet valves interconnected by ducts. Actuated by cams, the valves are so arranged that rotation of the camshaft opens the proper combination of poppets to direct the fluid through the valve to the desired location. A position stop pin prevents overrunning of the camshaft. Electrol, Inc., Kingston, N. Y.

•

CUTTING TOOL

Triple-purpose pocket-sized hand tool, known as the "Shearite," cuts machine screws without damage to threads, and

Another Steelcraft Sensation!

AMAZING NEW

ALL-METAL BUILDING

WITH 50-FOOT CLEAR SPAN!

Solve Your Warehouse and Production Space Problems!

Ready for Delivery NOW!

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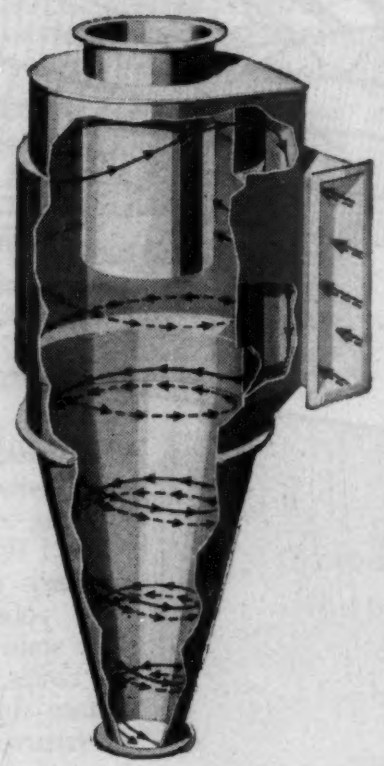
WHAT'S THE ACTUAL COST OF

Dust

RECOVERY?



Accurate reckoning

naturally must include long-range operation and maintenance costs. A good number of Buell installations, in a wide range of industrial uses, have been serving for 10 years with next to no maintenance. Operating costs are low with mechanical simplicity; no moving parts. Buell design eliminates plugging. And efficiency is high, because of the patented van Tongeren 'shave-off'. The Buell dust recovery system may mean real economy to you. Skim the facts or study the details in the new 32-page catalog. Write: Buell Engineering Company, 12 Cedar Street, New York 5, N. Y.

buell

Engineered Efficiency in DUST RECOVERY

cuts and strips electrical wire. Made of hardened alloy steel, it is fitted with shockproof plastic handles. Aircraft-Marine Products, Inc., Harrisburg, Pa.

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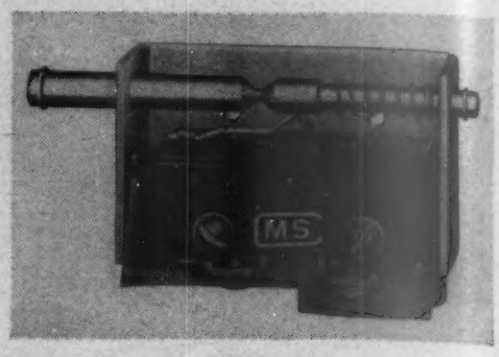


INTERLOCK SWITCH

Interlock door switch, for use on X-ray equipment cabinets, induction heating equipment, and electronic controls, automatically cuts off the power circuit when the cabinet door is opened. This permits repairs or test to be made safely when the cabinet door is open. The circuit can be closed for servicing or checking by manually moving the actuator, because actuator is automatically returned to normal position when the door is closed. This eliminates the necessity for "tying down" the switch or putting a jumper across the terminals. Micro Switch, Freeport, Ill.

•

FORK TRUCK SHOVEL ATTACHMENT

Shovel for use on fork truck has pneumatic snubber to cushion shocks and minimize strain to the upright assembly when the load is discharged. Has 3-point suspension, with a roller cam lock and a single point hook, which permits release of any load with a 15-lb. pull. Built of ¼-in. steel plate, shovel has a steel blade 6 inches wide, with flame-hardened edge, welded to the bucket. Clark Equipment Co., Tructractor Div., Battle Creek, Mich.

•

TOUCH-UP TINNING PENCIL

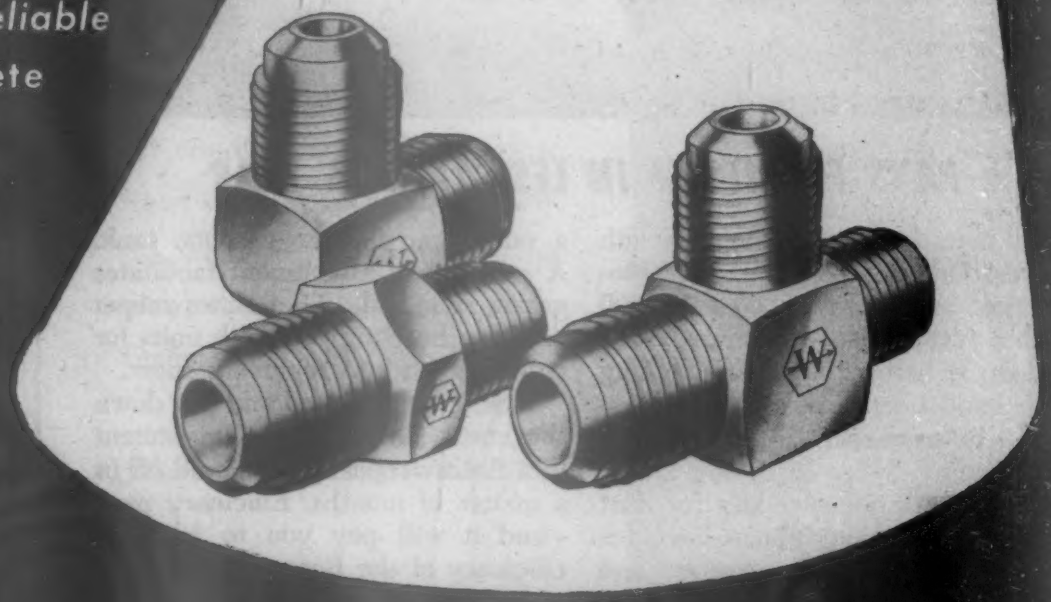
For rustproofing metal, regalvanizing spots, tinning bearings, touch-up pencil, known as Kromover, is claimed to tin oil-impregnated bronze, burned cast iron, all stainless steels, and black iron. It is not necessary to remove mill scale. The only preparation required is to wipe off the oil and dirt. The surface tinned will be ready for soldering. The protective coating formed by the pencil is corrosion-resistant. It goes on at 450 deg. F., and can be applied with oxy-

THE MARK OF QUALITY

The Right Fitting ...The Right Fit

Weatherhead Fittings are precision machined to S.A.E. Standards. Threads and bodies are clean cut for exact fits.

You can depend on Weatherhead as a *reliable* source for a complete range of sizes and types of fittings.



Look Ahead with

THE **Weatherhead** CO.

CLEVELAND 8, OHIO

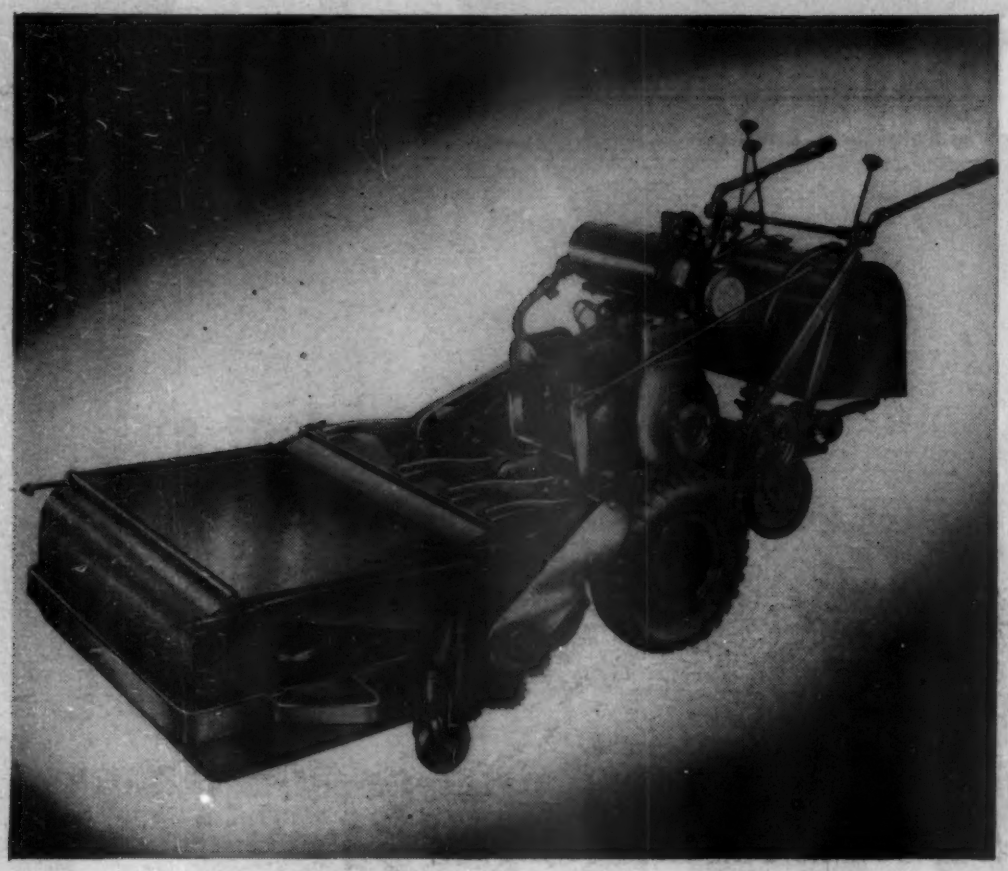
PLANTS AT CLEVELAND, OHIO • ANGOLA, INDIANA • COLUMBIA CITY, INDIANA
HOUMA, LOUISIANA • ST. THOMAS, ONTARIO, CANADA

IT WILL PAY YOU TO GET THE FACTS ABOUT THE LABOR-SAVING, MONEY-SAVING

IDEAL

Rotosweeper

FOR FACTORY FLOORS



PAYS FOR ITSELF IN LESS THAN A YEAR

Save man hours . . . Sweep with power! One man operating a Rotosweeper can clean 35,000 to 50,000 square feet of floor space an hour—and do it better than men working with hand brushes.

The Rotosweeper can be equipped with Riding Sulky or Riding Dolly. It has a pressure sprinkler for dust control. Safety equipment includes water muffler, spark arrester, and a safety cap for the gasoline tank. A steel brush attachment facilitates grease removal. The Rotosweeper can also be equipped with units for cutting grass and removing snow.

Pick up your pencil and put down the costs! Your original investment in a Rotosweeper will be paid off in a matter of months. Efficiency pays —and it will pay you to buy the efficiency of the Rotosweeper.

IDEAL POWER LAWN MOWER DIVISION

Indian Motocycle Company • Springfield 9, Mass.

Write for Complete Information

Rotosweeper users are the Blue Book of American business. Send for complete information about this labor-saving, money-saving asset to industry.

Ideal Power Lawn Mower Division, Dep. 1FM
Indian Motocycle Company, Springfield 9, Mass.

Please send me complete information about the Rotosweeper.

Name_____ Title_____

Company_____

Address_____

City_____ State_____

acetylene, airacetylene, or city gas flame. All-State Welding Alloys Co., Inc., 96 West Post Road, White Plains, N. Y.

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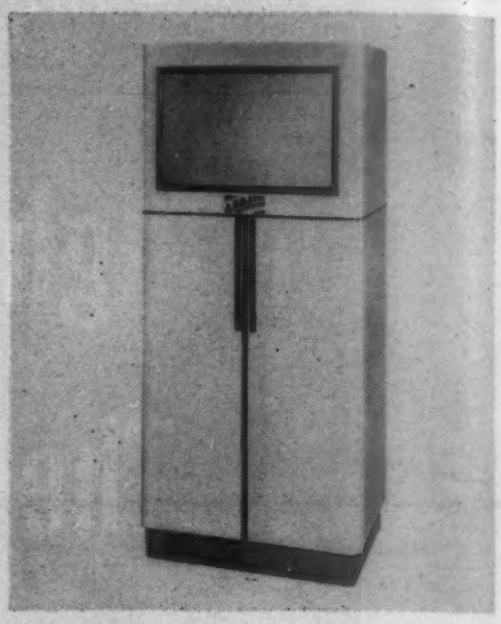

PROJECTOR

Automatic projector for training programs uses 30 standard 2x2-in. color or black-and-white slides. Enclosed in lightweight portable cabinet, with 15x22-in. non-breakable, non-flammable translucent plastic screen, it has a filtered air intake, which cools the system. Stop switch enables individual slides to be held if desired. Cabinet is 5½ feet high, 28 inches wide, 18 inches deep; is equipped with rubber casters, and contains 500-watt 500-hour projector lamps. Admatic Projector Co., Merchandise Mart. Chicago.

•

CONDENSATE RETURN PUMP

Packaged condensate return pump, called Condaflo, provides a constant flow of steam with return of high temperature condensate to the boiler. Occupies 18x24 inches of floor space. From 500 to 8000 square feet E.D.R.; capacity, 15 g.p.m. at maximum discharge. Discharge pressure, 20 pounds p.s.i. Manufacturer states that pump operates quietly, eliminates external piping, has a cast-iron receiver. Domestic Engine & Pump Co., Dept. 1, Shippensburg, Pa.

•

HEATER

Gas-fired forced-air heater, named "Panelair," is a self-contained unit for heating factory or office areas. Enclosed in a vertical metal casing, the vented heater occupies a rectangular floor space 20⅜x9⅜ inches. It can be fully or partly recessed in a wall, and in direct contact with wood. Warm air discharge is possible from all four sides. Two interior fans

draw air from the ceiling through grilles at the top, and heated air is forced out near the bottom. These top and bottom grilles are the only exposed portions when unit is recessed. Burns any type of gas fuel, and operation is automatic. Payne Furnace Co., Beverly Hills, Calif.

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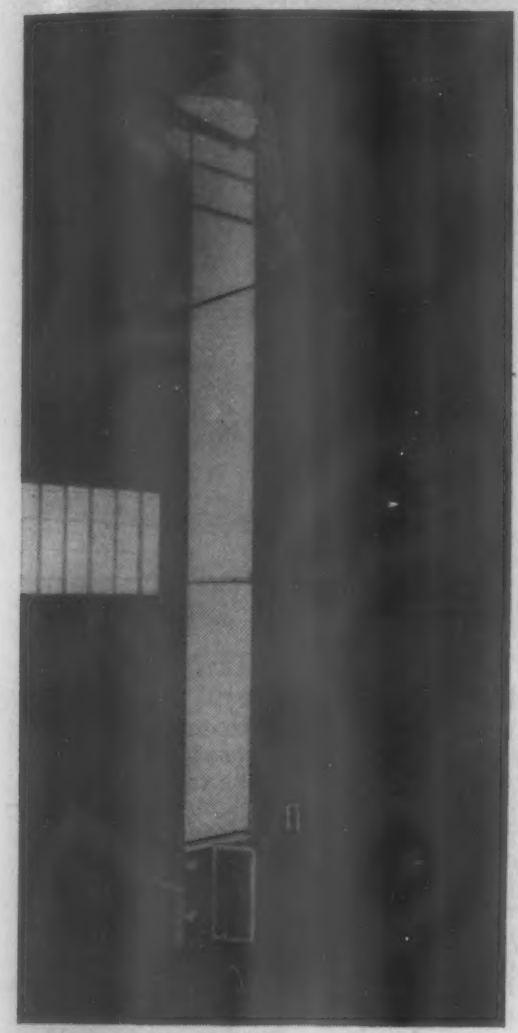


BUCKET ELEVATOR

Equipped with welded steel buckets spaced on 16-in. centers on a rubber elevator belt, 10x6-in. vertical centrifugal discharge-type bucket elevator can be furnished, by the addition of intermediate sections, to operate at a height of 45 feet. Its capacity for the handling of average free-flowing dry bulk material not over 1½-in. lump size, is 25 tons per hour. The floating boot section acts as an automatic take-up control. Bosworth Mfg. Co., 6723 Denison Ave., Cleveland 2.

•

ACID-CORE SOLDER

Known as Tri-Core Leakpruf Acid-Filled, solder has three distinct cores, with a chalk-like non-liquid acid flux. The three cores are said to develop a

"GROWS LIKE JACK AND THE BEANSTALK"

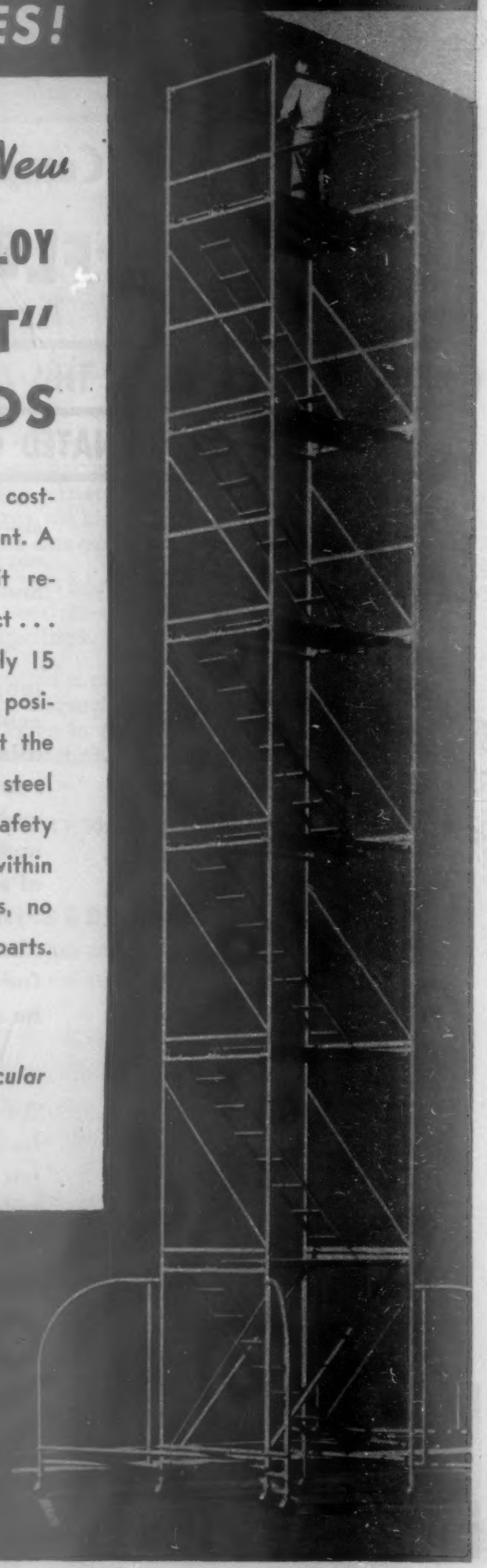
SET UP A 45 FOOT SCAFFOLD IN ONLY 15 MINUTES!

Revolutionary, New

ALUMINUM ALLOY "UP-RIGHT" SCAFFOLDS

Yours . . . this sensational cost-cutting scaffold advancement. A 7 foot, single section unit requires only 1 minute to erect . . . a 45 foot multiple unit only 15 minutes. Rolled easily from position to position throughout the job. Stronger than structural steel yet one-third the weight. Safety tread stairway completely within the structure. No wrenches, no wing nuts, no bolts, no loose parts. Each section folds flat.

Write For Descriptive Circular



"UP-RIGHT" SCAFFOLDS

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Offices in All Principal Cities

Complete
FLEXIBILITY
of Handling!

.....BECAUSE OF THIS A-F *ENGINEERED*

COMPLETELY CO-ORDINATED CONVEYING SYSTEM

By combining several types of A-F Conveyors in this plant of a leading manufacturer of radios, A-F Engineers overcame the problems of moving various weights and sizes; and changes in production pace—with *one completely co-ordinated system.* Parts, chassis, cabinets and completed products are carried the cost-reducing A-F Conveyor way through various departments for assembling and shipping.

The photo shows only a small portion of the extensive A-F System—at this stage an A-F Overhead Trolley Conveyor is carrying cartons and table model cabinets to a point where they will meet the chassis—also moving along at the correct predetermined pace on another A-F Conveyor line.

The efficiency of *your* plant, too, can be improved by *modernizing* your materials-handling and products-handling routine; by co-ordinating the endless flow of materials, parts and products through the use of an A-F *Engineered* Conveyor System. Such mechanical handling will reduce costs and pay for itself in a short time. Why be satisfied with less?

For a frank discussion with A-F Conveyor Engineers, backed by 47 years of experience, write, without obligation, today.

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Offices or Representatives in Principal Cities Coast-to-Coast

CONVEYING EQUIPMENT

A-F CONVEYING MACHINERY

Alvey-Ferguson

METAL PRODUCTS CLEANING EQUIPMENT

soldering sequence that provides an even flow of flux and an increased melting speed. This hard acid flux is said to solder stainless steel, monel, nickel, and all other metals except aluminum and magnesium. Manufacturer states that the synthetic acid used is an active flux, readily soluble in water, and easily washed off. Alpha Metals, Inc., 363 Hudson Ave., Brooklyn 1, N. Y.

•

THERMAL AMPERE-DEMAND METERS

Line of themal ampere-demand meters built into the same case with standard watthour meters can be used on single-phase or polyphase systems for industrial installations where kva. demands are incorporated into the rate. They are not intended for metering in larger industrial plants. Ampere demand is measured in these meters by heating bimetallic elements with current-carrying heaters. Readings can be converted to kva. demand by multiplying by a constant assumed voltage. Five types available: QCA for single-phase service; QCA-2 for 3-phase, 3-wire service; QCA-5 for networks consisting of 2 phases and neutral of a 3-phase, 4-wire service; QCA-7 for 3-phase, 4-wire delta service; and QCA-8 for 3-phase, 4-wire wye service. Westinghouse Electric Corp., Box 868, Pittsburgh 30.

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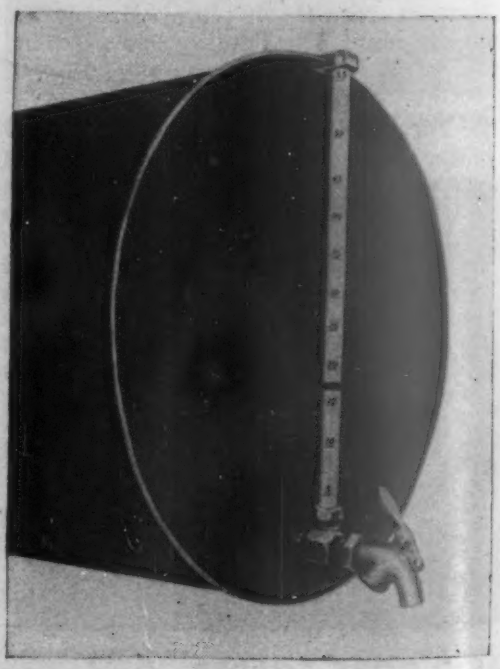


OIL GAGE

For use on 55-gal. drums, "Tru-Oil Gage" has no mechanical moving parts, indicates oil reserve at a glance. Has

For Any Atmospheric Hazard There's a CENTURY MOTOR— Properly Protected—To Assure Continuous Performance

To protect motors against the hazards of abnormal atmospheres, Century provides Totally Enclosed Fan Cooled and Explosion Proof frames, also Splash Proof.

These are in addition to open type frames on which the upper half of the frame is protected against falling or dripping particles.

Whatever your requirements there's a Century motor designed to accurately meet the needs of your equipment.

The illustrations here are typical of the variety of applications which are successfully powered by Century motors.

1—Century 7½ horsepower *totally enclosed fan cooled* motor drives an elevator leg in a dusty, dirty atmosphere.

2—Century 5 horsepower *explosion proof* motor provides protection against explosions at a gasoline storage plant.

3—Three horsepower Century *splash proof* motors provide protection from splashing water as well as from all kinds of weather conditions on a railroad car-washing unit.

4—Century 100 horsepower *general purpose* motors are used to drive air compressors in clean surroundings.

Century builds a complete line of fractional and integral horsepower electric motors, in all popular sizes to meet the requirements of industrial production, commercial and appliance needs.

Specify Century for all your electric power requirements.

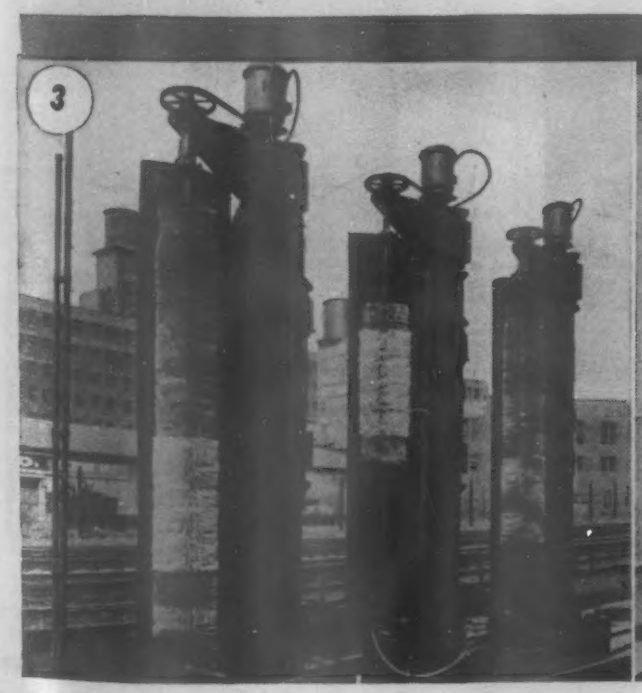
CENTURY ELECTRIC COMPANY

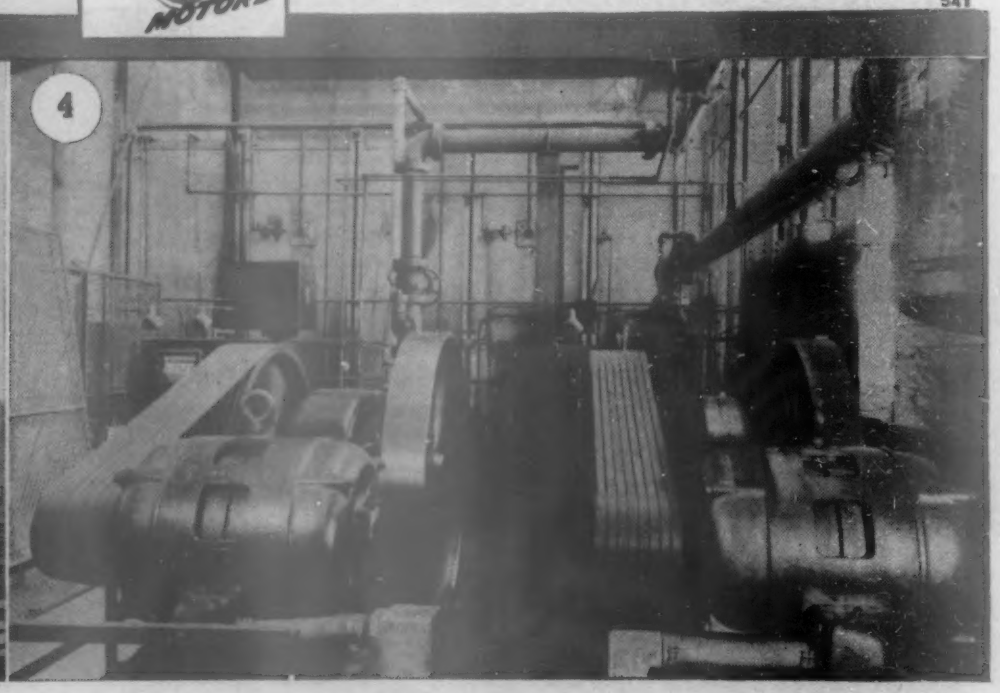
1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

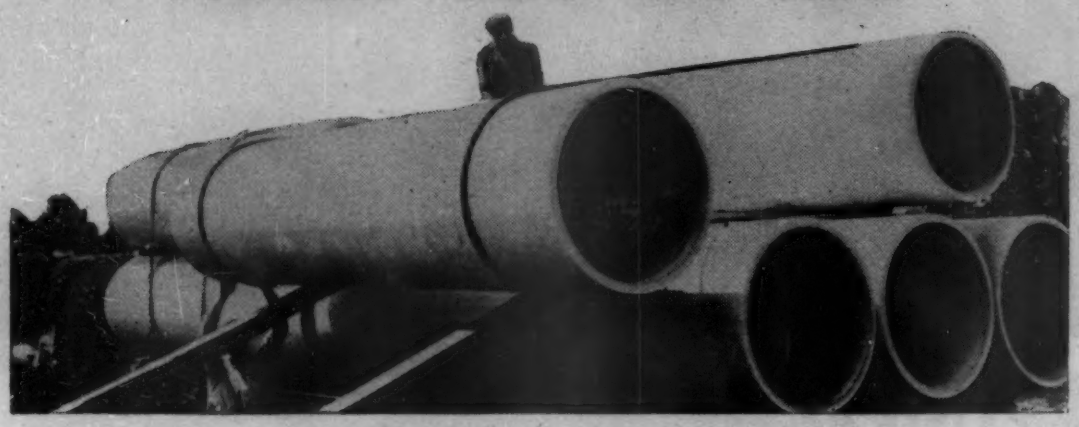
Century C MOTORS

541



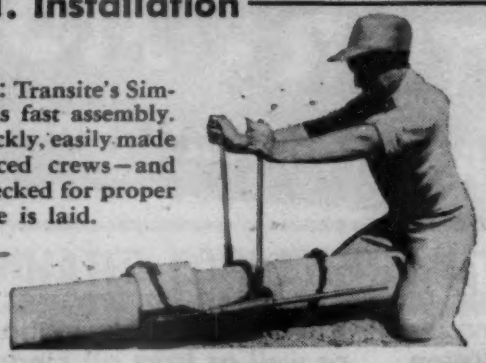


3 ways Transite Pressure Pipe reduces water line costs



1. Installation

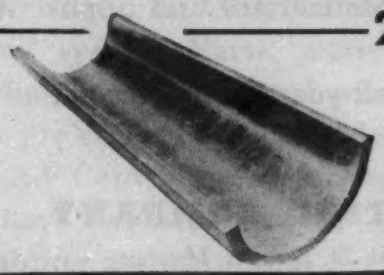
QUICKLY ASSEMBLED: Transite's Simplex Coupling means fast assembly. Perfect joints are quickly, easily made even by inexperienced crews—and each joint can be checked for proper assembly as the pipe is laid.



EASILY HANDLED: From unloading to final installation in the trench, Transite's light weight means easy handling. Most sizes can be handled without mechanical equipment. And, more footage can be carried per truckload.

DEFLECTIONS: Deflections up to 5 degrees at each joint are possible in Transite water lines. Flexible Simplex Couplings permit laying pipe around curves and obstructions without special fittings.

2. Operation



MAXIMUM FLOW—LOWER PUMPING COSTS: The smooth interior of Transite Pressure Pipe assures minimum friction loss, maximum flow. And because Transite is made of asbestos and cement, it cannot tuberculate and lose its high flow capacity. Pumping costs, as a result, stay low.

3. Maintenance

RESISTS CORROSION: Installations in cinder fills, salt marshes, etc., prove Transite's high corrosion resistance. Furthermore, Transite Pipe cannot rust . . . cannot cause "red water."

WITHSTANDS VIBRATION: A Transite line is protected by Simplex Couplings . . . each a flexible "link" that helps the line absorb stresses and vibration—safeguards against costly leakage.

For additional facts about Transite Pressure Pipe, including engineering data, write Johns-Manville, Box 290, New York 16, N.Y.

Johns-Manville
TRANSITE PRESSURE PIPE
for Water Supply Lines • for Fire Lines • for Process Lines

heavy bronze T fitting; tapered ¾-in. pipe thread for use with any standard drum or faucet; calibrated plastic tubing containing red cork float; brass cap and screen air vent; and compression nut and gasket to secure gage tube to bronze fitting. Can be used indoors or out. Mastercraft Products, 60 South St., Boston 11.

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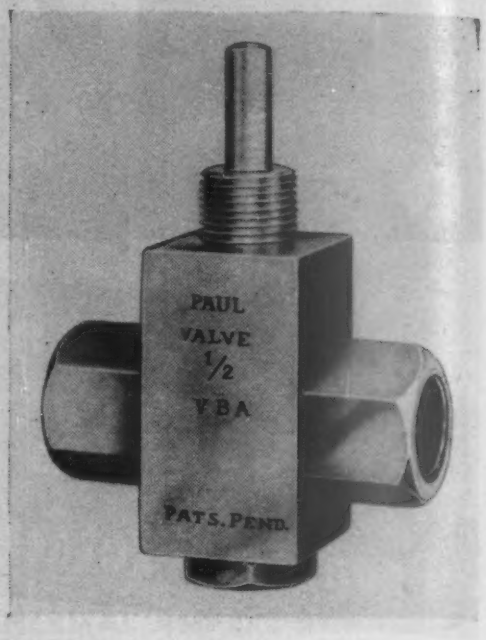

VALVE

Straight-through automatic valve, for use on any automatic machine where fluids must be turned off and on in controlled sequence, opens with light push on stem, and can be actuated by cam, lever, solenoid, or diaphragm. It automatically closes whenever fluid flows through the venturi. Yoke is shaped like an inverted *U* straddling the stream, so that when valve is open there is no restriction in the straight-line flow. Variations in the length of stem, size of valve, stem travel, solenoid, or other means of operation are available. Paul Valve Corp., 683 3rd Ave., New York 17.

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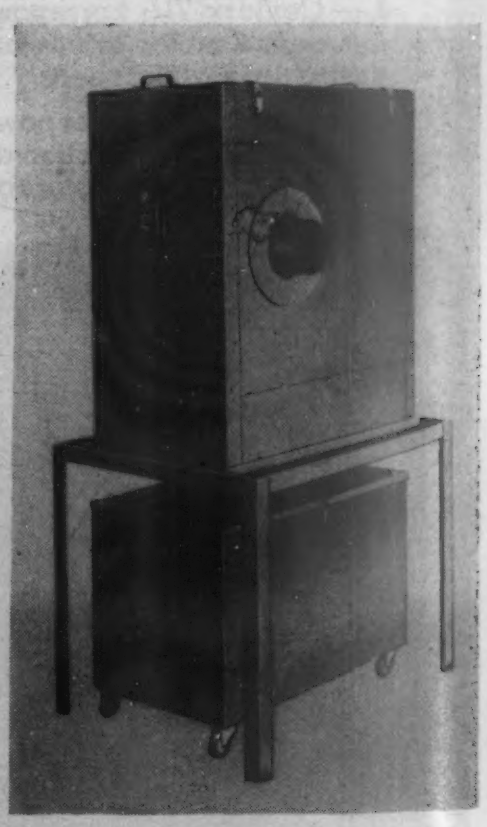

DUST COLLECTOR

Self-contained, unit-type dust collector, Model 11B50, for operations where large

New

A big-capacity, heavy-duty production unit engineered for safety ... accuracy ... convenience

Delta* 20" Wood-cutting Band Saw

Takes any type of blade in any size up to 1 inch in width. Maximum height under upper guide is 13½"

Now you can enjoy famous Delta quality in a heavy-duty wood-cutting band saw designed to meet the needs of your pattern shop, maintenance shop, shipping department, and other departments where you perform wood-sawing operations.

Delta 20" Band Saw features are among the newest and most advanced in the industry — many of them exclusive with Delta:

- Single-unit welded steel cabinet completely encloses all working parts. Doors provide quick access to wheels and motor.
- Adjustable "three-point mountings" between working parts and welded steel frame help to maintain exact alignment.
- Statically-balanced aluminum wheels are mounted in sealed-for-life ball bearings. Handy adjustable control on upper wheel helps you to maintain proper blade tension for each particular job.
- Wheels are made of aluminum, to reduce flywheel action after motor is shut off.
- Convenient foot brake is provided on lower wheel.
- Motor is mounted in base on pivot bracket which automatically provides correct belt tension.
- Dust chute carries away dust and chips . . . can be attached to dust collector.

These are just a few of the reasons why you can expect creditable performance from the new Delta 20" Wood-cutting Band Saw.

Your nearby Delta distributor can give you the complete story on this new, husky machine. See him soon. Look for his name under "Tools" in the classified section of your telephone directory.

DELTA MANUFACTURING DIVISION
ROCKWELL MANUFACTURING COMPANY
MILWAUKEE 1, WISCONSIN
General Sales Office • 6 NORTH MICHIGAN AVENUE, CHICAGO 2, ILLINOIS

*Trade Mark Reg. U. S. Pat. Off.

20" x 24" table is rigidly supported on two widely-spaced trunnions. Conveniently tilts 45° to right; 12° to left.

Heavily-ribbed table is slotted to accommodate miter gage. It is also adaptable to use of a rip fence, as shown.

Ball-bearing blade guides, above and below table, are fitted with micrometer adjustment.

• Free Bulletin! Gives specifications and detailed description of Delta 20" Wood-cutting Band Saw. There's a copy ready for mailing to you. Request it by coupon below.

TEAR OUT COUPON AND MAIL TODAY!

DELTA MANUFACTURING DIVISION
619F Vienna Ave., Milwaukee 1, Wis.

Send me free copy of Bulletin A-28-3 describing Delta 20" Wood-cutting Band Saw.

Name_____
Position_____
Company_____
Address_____
City_____ (____) State_____

ELECTRIC MOTOR BEARINGS

• *Over 300 types*
• *From stock*

Here's the most complete motor bearing service on the market. Over 300 distinct types . . . everyone correct in design, alloy and tolerance . . . ready for immediate installation . . . available from stock. It is no longer necessary to put up with expensive delays . . . to keep men and machines idle while waiting for new bearings. Simply call your local Johnson Bronze Warehouse. Your needs, in any quantity will be shipped immediately.

Every Johnson Bronze bearing is made of the highest quality materials, precision finished and designed to give you the utmost in performance and bearing life. Our new catalogue lists and describes this complete bearing service. Write for a copy today. Johnson Bronze Company, 512 South Mill Street, New Castle, Pennsylvania.

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JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS
BRANCHES IN 20 INDUSTRIAL CENTERS

volumes of dust, lint, chips, and other small refuse are involved, employs a roll-away bin with clamp-down cover to collect and store the dust, and facilitate its removal. Release of four latches which hold the lid permits its being moved up clear of the bin where it is suspended by four springs. Flexible sleeve connects lid to unit. Bin is equipped with swivel rollers and handles at each end. Suction capacity on a 6-in. inlet is 1394 c.f.m. at 3.2 in. static suction, developed by a 1½-hp. 3450-r.p.m. continuous-duty motor, direct driving a paddle-wheel type fan. Dust-laden air is cleaned after passing through the fan by a cyclone separator. The top of the unit, made of spun glass, furnishes a second cleaning of the air before it is returned to the working space. Dimensions of the unit are 24x40x72 inches. The bin measures 20x36x21 inches. Aget-Detroit Co., Main at Washington, Ann Arbor, Mich.

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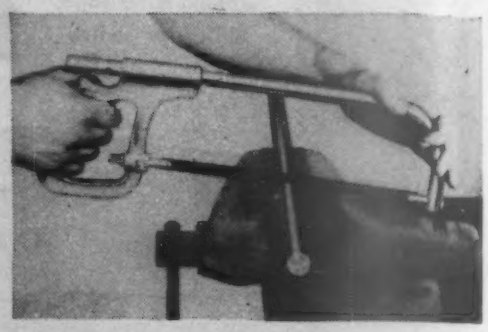

HACKSAW FRAME

The one-piece steel tube fitted into cast-aluminum handle of "Rigid" hacksaw frame permits tightening the blade to high tension to maintain alignment. The blade holders are slotted to eliminate side or vertical deflection. Handle is designed so that the thrust is directed behind the blade instead of above it. Frame is adjustable for 10- and 12-in. blades. Dept. J-907, Machine Rebuilding Co., 2738 Chene St., Detroit 7.

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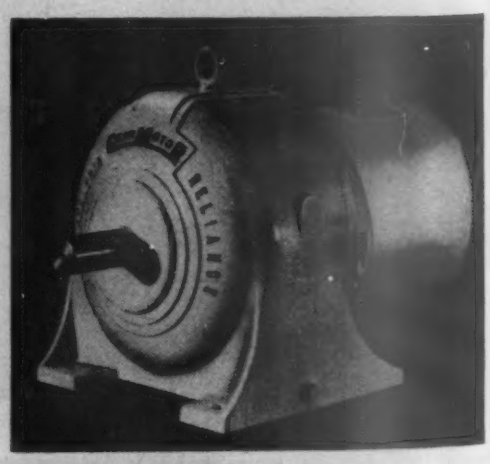


GEARMOTOR

Built in six basic sizes or diameters capable of delivering from 1 to 60 horsepower, helical type horizontal gear motor units are integral a.c. or d.c. motors with flange mounting. They operate in a speed range of from 7½ to 780 r.p.m. Single, double, and triple reduction units are available in each size. Use of a flange-mounted motor, complete with bearings and bracket, and with shaft modified only to permit mounting of a hardened pinion, will permit many standard or special motor enclosure types to be used without expensive adaptations. A number of enclosure types, including protected open, splash-proof, grip-proof, totally enclosed non-ventilated, totally enclosed fan-cooled, Underwriters' Class

Another Thermoid *First!*

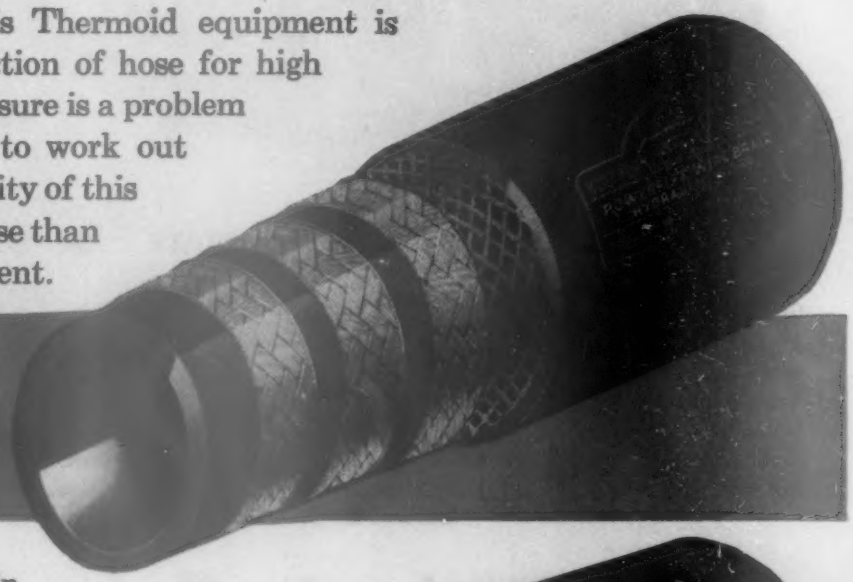
New Wire Braiding Equipment Produces Larger, Stronger Hose for High Pressures

The world's largest wire braiding machine specifically designed for the manufacture of hose is now in production at Thermoid's modern Nephi, Utah, plant. The possession of this equipment enables Thermoid to make wire braid hose in larger sizes and with greater strength than had previously been possible.

Hoses of 2, 3 or 4 braids can be made on this machine in sizes up to 2½" I.D. That means Thermoid can make hose that will rival pipe in strength but still have the flexibility of rubber. The specifications of Thermoid's hose for carrying high pressure are superior to any current production on the market.

If Pressure Is A Problem

In addition to the hoses specified below, this Thermoid equipment is available for special designs involving construction of hose for high pressure work. If you have a hose use where pressure is a problem give us the overall facts. We will undertake to work out a practical design that can use the unusual capacity of this machine to produce a stronger, more compact hose than could be made by any other method or equipment.



Powerflex Wire Braid Hydraulic Hose

Can now be produced in sizes from 3/16 to 2" I.D. in 50 ft. lengths, in 1, 2, 3 or 4 braids, working pressures from 500 to 5,000 lbs.

Powerflex Wire Braid Steam Hose

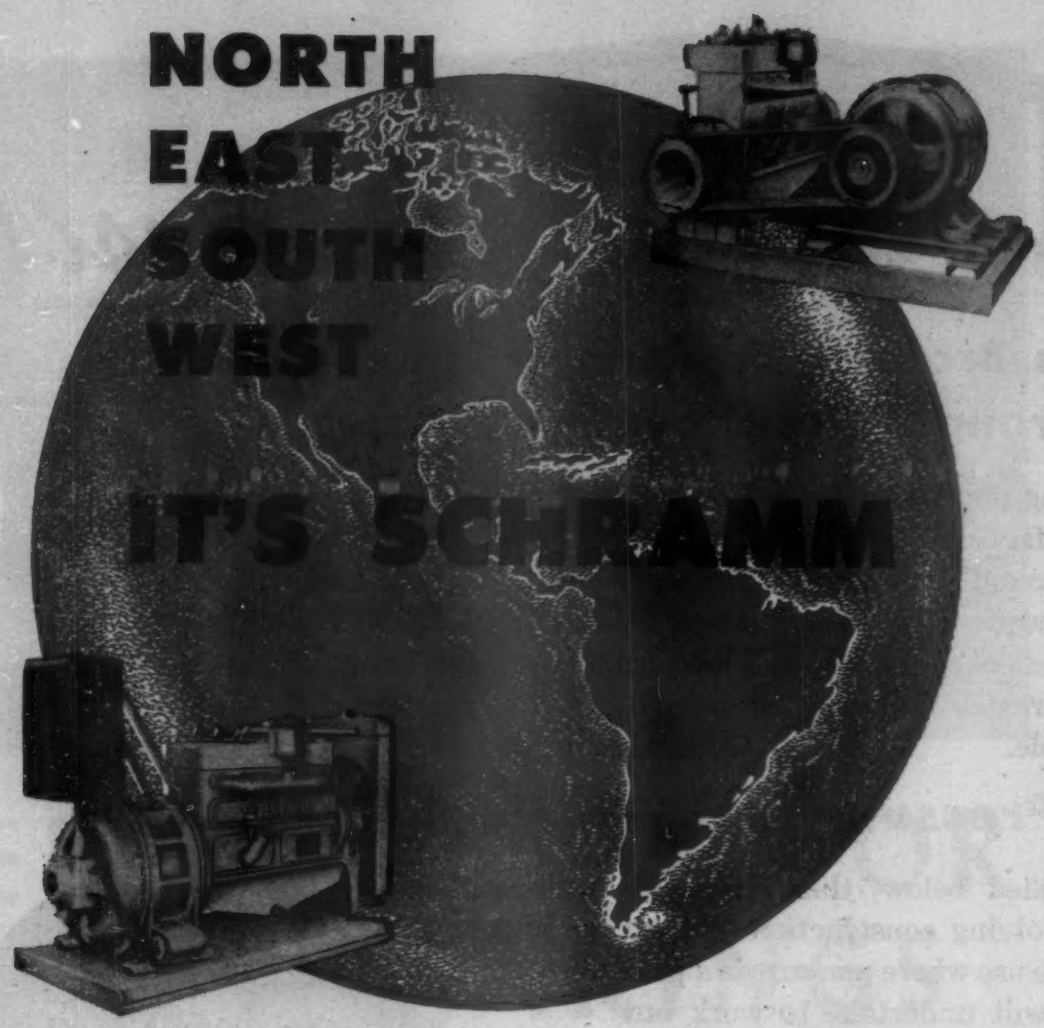
Practically burst-proof because of the wire braid reinforcing.

Recommended for pressures up to 200 lb. saturated steam. Specially compounded tube resists heat—asbestos cord layer dissipates heat and forms a permanent bond to the tough, rubber cover. Available in sizes ½ to 2½" I.D. and in lengths up to 50 ft.

The Thermoid line includes: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Custom Molded Products • Industrial Brake Linings and Friction Materials.

Thermoid Thermoid Company · Trenton, N. J., U. S. A.

Automotive · Industrial · Oil Field · Textile Products



SO VERSATILE

. . . because Schramm can furnish air for any compressed air job in your work; and versatile because there is a size and model Schramm to fit your individual needs! Just specify the size you need.

SO EASY TO OPERATE

. . . merely by pushing a button to start, and compact and lightweight enabling you to move the portable units wherever you like! Meanwhile, the stationary units take up very little room, are vibrationless and no trouble!

SO ECONOMICAL

. . . because Schramm can do *all* your compressed air jobs quickly and efficiently. Features that assure economy include 100% water cooled, forced feed lubrication, and mechanical intake valve.

it pays to use Schramm!

Your field has found that Schramm Air Compressors well fit its needs. And has specified Schramm everywhere . . . North, East, South and West. Write today for full data.

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PENNSYLVANIA

1-Group D, Glass II-Groups Fand G, and Bureau of Mines' can thus be bolted to any of the gear elements without alteration. The Reliance Electric & Engineering Co., Cleveland.

•

CONVEYOR BELT

Cushioned with rubber and strengthened with glass, hot materials conveyor belt will not char or lose strength from heat under 350 deg. F., nor will it lose strength at the fasteners by heat burning out around bolts, according to the manufacturer. Because there is very little elongation in Fiberglas fabric, and because the plies are said to be as strong as steel of equal weight, the belt will not stretch. Hewitt Rubber Div., Hewitt-Robins, Inc., Buffalo 5.

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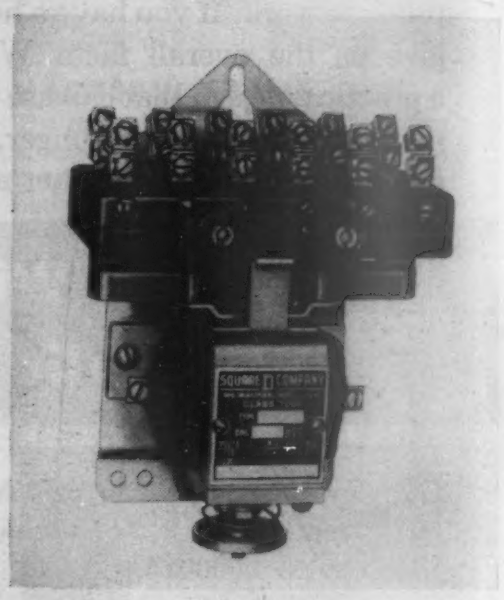


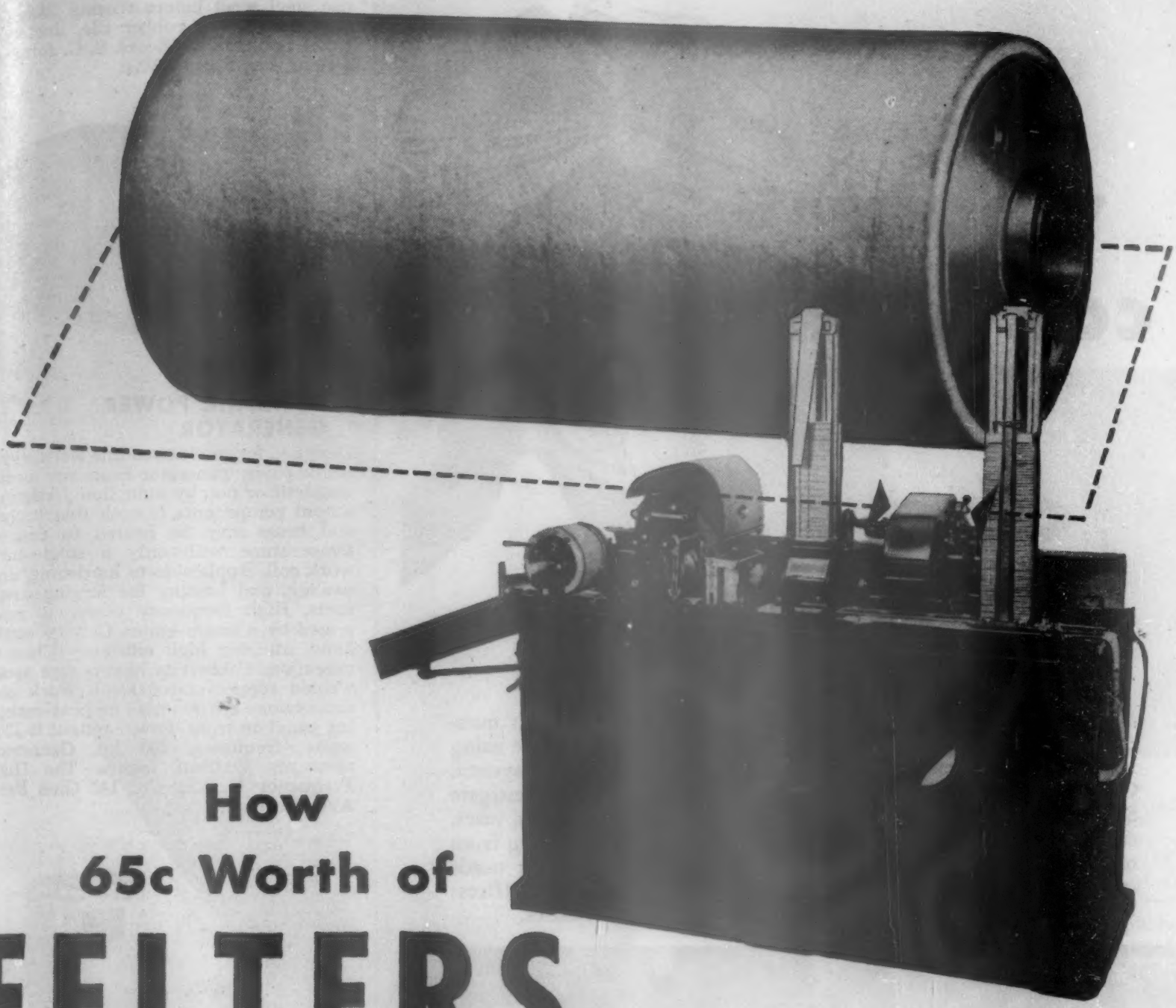
RELAYS

Two d.c. magnetic multi-pole relays, Types Q and R, have straight-line vertical solenoid action, said to minimize effects of shock and vibration and the possibility of the contacts being closed accidentally. Both relays utilize double-break, silver-to-silver contacts, which may be converted from normally open to normally closed without additional parts or tools. Relays are steel-panel mounted and insulated to permit direct mounting on a grounded metal panel. All terminals are accessible from the front, and are equipped with two wiring clips to accommodate multiple connections. Type Q is available with from 2 to 6 poles, and Type R, from 2 to 5 poles. Square D Co., Industrial Controller Div., 4041 North Richards St., Milwaukee 12.

•

LIQUID CLEANER

A blend of soaps and detergents, floor cleaner, mixed with 20 parts of water, softens or loosens old wax and dirt, allowing it to be rinsed away with clear water. On unusually dirty floors, maker says it may be necessary to agitate the cleaner on the floor with a mop, or to



How 65c Worth of FELTERS FELT

Helps a $12,000 Machine Make a Good Impression

"The inking system is the heart of the addressing machine," says Mr. E. R. O'Hara, General Sales Manager of the Elliott Addressing Machine Company, world's largest manufacturer of automatic addressing machines. "To insure the success of the inking system, it is of top importance to use the proper felt roll."

Felters Felt does this exacting job in every machine built by Elliott, throughout the line of 72 models, priced from $45 to the special combination $12,000 machine illustrated.

Felt washers are slipped over a metal core and are held in place at each end by a flange to form the inking rolls. Density of the felt in all the washers must be absolutely standard and unvarying, in order to prevent undesirably heavy, wet imprints which could blot or smear. Elliott buys many different sizes of these washers from The Felters Company. Every washer is ready for assembly after a single, elementary grinding operation.

As for durability, these rolls of Felters Felt are expected to last for 10 or more years of regular usage.

Felters Felts have solved many difficult problems. Perhaps they can help you. Write for Felters Cut Felt Parts Manual today.

THE FELTERS COMPANY

210-A SOUTH STREET, BOSTON 11, MASSACHUSETTS

Offices: New York, Philadelphia, Chicago, Detroit

Sales Representatives: San Francisco, St. Louis

Makes the Felt for the Parts it Cuts

"COOLIE" CONVEYING IS COSTLY

Yes, "coolie" conveying is costly because it takes so much manpower to reach modern production capacity levels. If you're using manpower in material handling — you're using a "coolie" system. Conveyors keep manpower on the production line! Investigate Standard Conveyors to handle pieces, parts, units, assemblies, cases, cartons, boxes, barrels, bales, bundles, packages — everything from mail to malleable iron castings! There's one to meet your needs in shop or warehouse. Standard Conveyor Co., General Offices: North St. Paul 9, Minn. Sales and Service in Principal Cities.

FREE HELPFUL LITERATURE

Send for Standard's Catalog. See how conveyors are used in every field of industry. Ask for Bulletin No. FM-68

Standard
GRAVITY & POWER
CONVEYORS

use steel wool before rinsing. May be used on asphalt, rubber tile, linoleum, wood, and terrazzo floors. S. C. Johnson & Son, Inc., Racine, Wis.

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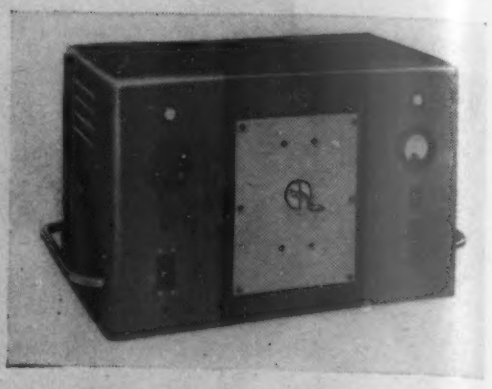

ELECTRONIC POWER GENERATOR

Designed for production line work, electronic power generator heats any metal, magnetic or not, by induction. Design of output components is such that copper and brass may be heated to desired temperature with only a single-turn work coil. Applicable to hardening, annealing, and heating for forging small units. High frequency power is generated by a single-ended Colpitts oscillator, utilizing high efficiency Class C operation. Cabinet is heavy-gage spot-welded copper-plated steel. Work coil connections are mounted on heat-resisting panel on front. Power output is 1200 watts, frequency 400 kc. Generator measures 30x18x19 inches. The High Frequency Heating Co., 143 Glen Park Ave., Gary, Ind.

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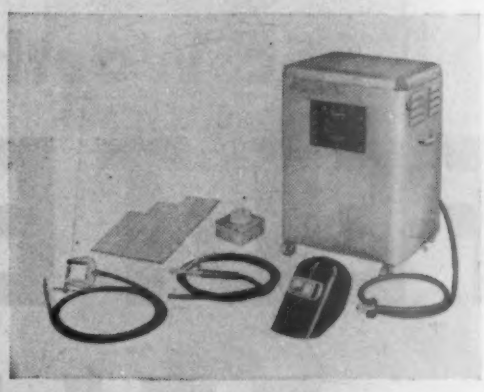

WELDING UNIT

Housed in a steel cabinet, a.c. welding unit has heavy-duty swivel casters welded to the cabinet. Heavy plating protects all exposed parts from rust. Louvers in back and both ends and screened vents on all four corners of the top furnish ventilation. On-and-off switch provides control. Unit has 12 heats, beginning at 10 amps. The two lowest heats accommodate electric torch for soldering, brazing, preheating. Foster Mfg. Co., 1 Kinsey Ave., Buffalo 17.

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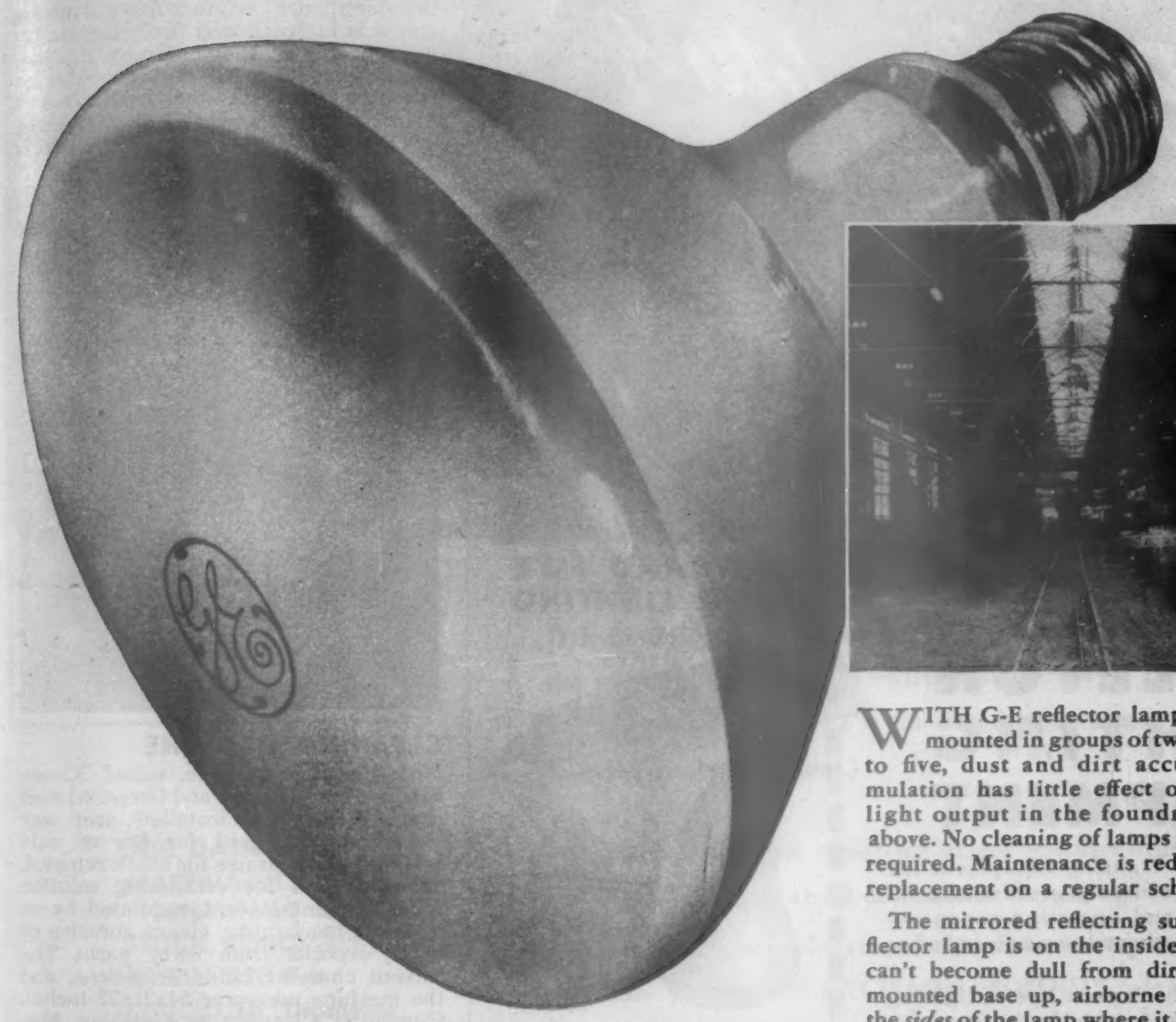
HAND TOOL

Called Drilhamer, tool is used to convert the rotary motion of any ¼-in. electric

Stays bright without cleaning in spite of dirt and smoke



WITH G-E reflector lamps mounted in groups of two to five, dust and dirt accumulation has little effect on light output in the foundry above. No cleaning of lamps is required. Maintenance is reduced to simple bulb replacement on a regular schedule.

The mirrored reflecting surface of the G-E reflector lamp is on the inside of the bulb itself—can't become dull from dirt or tarnish. When mounted base up, airborne material collects on the *sides* of the lamp where it has no effect on light output. Little or no light obstructing material collects on the bottom surface.

With the lamps in clusters of two or more, a burnout need not be replaced immediately; you reduce maintenance costs by making replacements on a regular schedule. G-E reflector lamps are available in 150 and 300 watt sizes.

IMPORTANT REASONS *why it pays to insist on G-E when you buy lamps*

1. **Complete line to choose from—over 10,000 types and sizes.**
2. **Quality assured by more than 480 tests and inspections.**
3. **G-E makes all lamp parts.**
4. **Most improvements in lamps and lighting have come from General Electric.**
5. **Services of G-E lighting engineers conveniently available.**
6. **General Electric research works constantly to make G-E lamps *Stay Brighter Longer!***

Whatever Lamps you need
FLUORESCENT
Soft, cool light makes work safer, easier.
FILAMENT
All types and wattages for every lighting need.
MERCURY
Concentrated light sources for high-bay shops.
INFRARED
For drying, baking, curing and other heat processes.
INDICATOR
Glow and filament type. For instruments, etc.
SILVERED BOWL
Indirect lighting at low cost, 60 to 1000 watts.
-G-E makes 'em all

G-E LAMPS

GENERAL ELECTRIC

STEP UP PRODUCTION WITH *Better Lighting*

Appleton "Goodrich" Seprable Reflector Porcelain Enameled—Instantly Serviceable —Weatherproof.

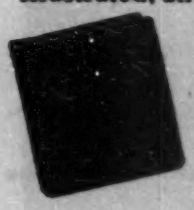
STANDARD FOR BETTER LIGHTING

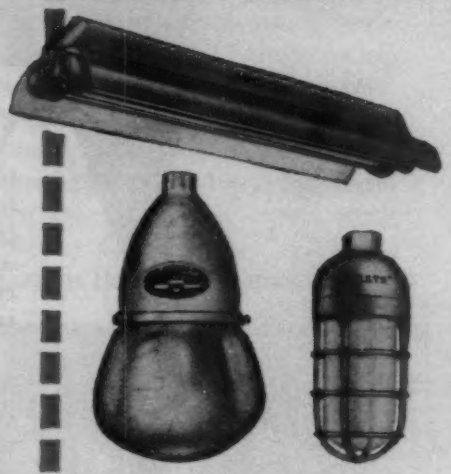
APPLETON LIGHTING EQUIPMENT

Look to Appleton Lighting Equipment for maximum lighting efficiency at minimum installation, service and operating expense—whatever the illuminating requirement, whether indoors or out.

Now including the famous line of lighting fixtures formerly manufactured by the Goodrich Electric Company, Appleton Lighting Equipment is your unified and convenient source of supply and information for virtually any industrial lighting need. Complete in every phase, the Appleton line is expertly engineered and machined—precision-manufactured with the highest quality materials.

Make the Appleton Catalog your convenient buying guide. Fully detailed and graphically illustrated, an Appleton Catalog will be mailed to you immediately upon request. Be sure to have one and use it for faster, easier—completely dependable purchasing of all lighting and electrical equipment.





Appleton—makers of the FIRST Explosion-Proof Fluorescent Lighting Fixture—offers numerous types and combinations of dependable Explosion - Proof Fixtures. Dust-Tight and Vapor-Tight Fixtures, too, in a variety of types and sizes to meet your requirements.

Outdoor Illumination At Its Best

The famous Appleton "Goodrich" No. 95 Floodlight brings day-like illumination to service stations, parking areas, athletic fields. Easily maintained, designed to bring better business.

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APPLETON ELECTRIC COMPANY

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APPLETON ELECTRIC - PRODUCTS - REG. U.S. PAT. OFF.

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES
EXPLOSION-PROOF FITTINGS • REELITES

drill, drill press, or flexible shaft with ¼-in. chuck, into hammer action for any purpose where rapid moderately heavy hammering is required. It strikes "blow per revolution" of the driving mechanism. Blow is delivered to the drill bit by an inside hammer actuated by a heavy vanadium alloy spring. The only duty of the electric drill or other driving mechanism is to "cock and fire"; the spring delivers the blow. In masonry drilling, the rotation of the tool bit is provided by reactions within the tool itself. Tool is 6½x1⅛ inches, and weighs 2 pounds. Dril-Hamer Co., 131 West 83rd St., New York 24.

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CLEANING MACHINE

Parts-cleaning machine, called Klene-Ezy, has hinged cover and tempered steel shell. It may be installed near any electric outlet, used for hot or cold washing. It has drains for muck removal, and provision for reclaiming solution used. Swirling solvent, regulated by an agitating mechanism, cleans abrasive or other deposits from dirty parts. The solvent chamber holds 30 gallons, and the machine measures 54x21x32 inches. Cincinnati Cleaning & Finishing Machinery Co., Ironton, Ohio

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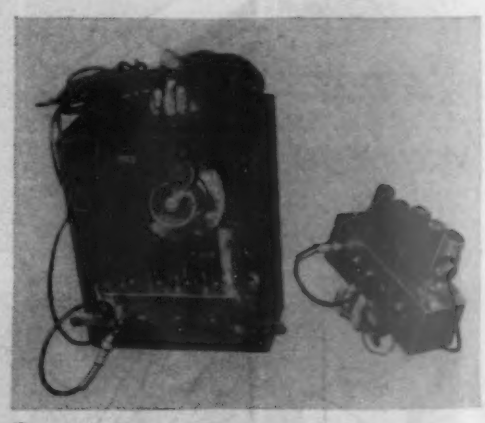
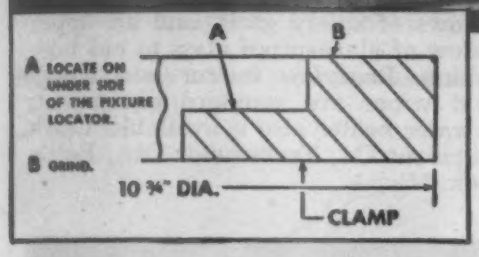


AMPLIFIER, PAGING SYSTEM

Small combination telephone amplifier and loudspeaker paging system is designed to permit group loudspeaker listening to 2-way telephone conversations, as well as for paging purposes. Model LK, 2¾x2¾x8 inches, weighing 2 pounds, comprises the amplifier, 4 tubes, built-in loudspeaker, and a small inductor unit which fits over the telephone earpiece, or may be concealed inside the telephone box. No electrical connection to the telephone or telephone wires is necessary; inductor unit is held in place by scotch tape or rubber bands. Model SK has a

"Put it on the Blanchard"



This Textile-Knitting Machine Part Met These 3 Requirements....

1. **FINISH, better than 10 micro-inches**
2. **FLATNESS within .0005"**
3. **CLOSE-TOLERANCE LINE-UP to previously machined surfaces**

THE BLANCHARD No. 11 was chosen for this job because it met all the requirements—with a PRODUCTION RATE OF 12 PIECES PER HOUR. (That's 3 x 12 = 36 requirements per hour—or 1-7/10 minutes per requirement.)

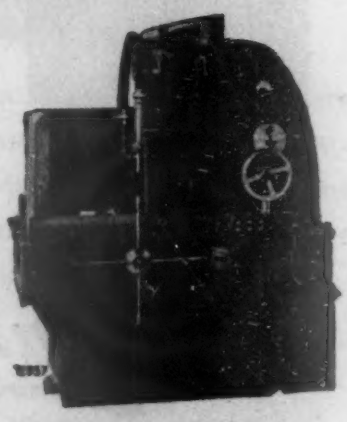
JOB DATA:
MATERIAL: Cast Iron (stress relief annealed)
STOCK REMOVAL: .008"
WHEEL: 220 Grit
CHUCK: 16" Diameter

Such speed in meeting strict requirements is typical of the Blanchard Method of Surface Grinding.

And such speed—translated into cost-per-piece—accounts for the words "BLANCHARD GRIND" alongside the most profitable figures on the Cost Investigation Sheets of production engineers.

Let the knowledge and skill of Blanchard Engineers assist you to the most profitable answer to your flat surface grinding problems. Blanchard Service (free, of course) includes a thorough analysis of your problem, recommendations, reliable production data, and sample grinding. Write us today—or anytime.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.
Work
THIRD EDITION

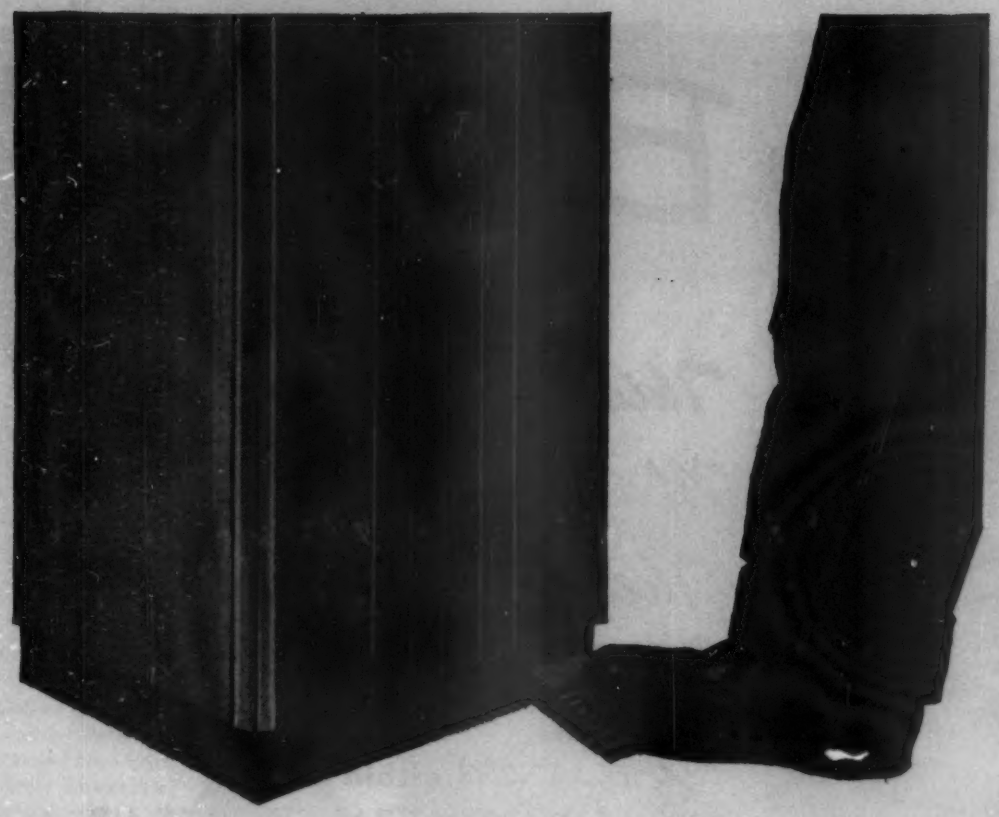


No. 11 BLANCHARD SURFACE GRINDER.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.



A STEP TOWARDS GREATER EFFICIENCY

YOUR workers' efficiency can depend on the amount of water they drink to replace sweat loss, according to recent scientific studies*. That is why strategically located General Electric Water Coolers become an aid for efficient production. Cool, palatable water from these attractive, compact units gives your workers extra zip throughout the day.

Economical Operation

What's more, it costs only a few cents a day to operate these sturdily built G-E Water Coolers. For either the foot pedal type or bottle type . . . call your General Electric Dealer today! *General Electric Company, Air Conditioning Department, Section W8726, Bloomfield, New Jersey.*

*American Journal of Physiology, Vol. 142, No. 2

GENERAL ELECTRIC

Water Coolers

larger loudspeaker built into a desk or wall-type baffle. It is wired with 40-ft. cable and plug, and equipped with carrying handle. Miles Reproducer Co., Inc., 812 Broadway, New York 3.

•

FORK TRUCK CAB

Welded steel, sound-insulated, all-weather cab for use on the "Yardlift-40," pneumatic-tired fork truck, is fully enclosed, with entrance door on the driver's side. It is equipped with sliding windows of safety glass, and an upper window of glare-proof glass to aid high stacking. Rearview mirror and windshield wiper are standard equipment; hot water heater also is available. Clark Equipment Co., Tructractor Div., Battle Creek, Mich.

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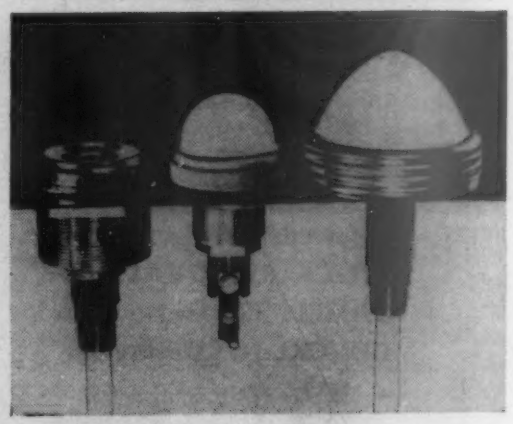

INDICATING LAMPS

Line of slide-base bulbs, called T2, has current characteristics as low as 0.038 amp. on low voltages, 6/12/24 volts. Suited for use with a series resistor on 120/220/440/550 volts, all bulbs are for single-hole panel mounting. A variety of lenses and diameters is available, and resistors on brackets can be furnished for voltages of 120/220/440. The H. R Kirkland Co., Morristown, N. J.

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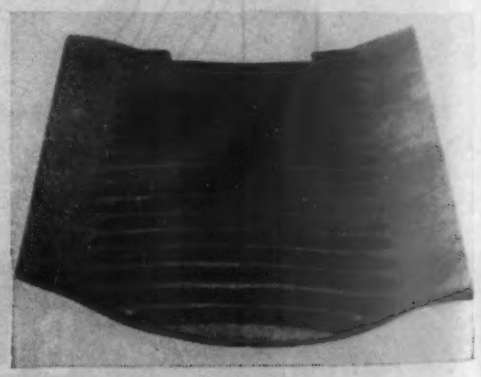


CONVEYOR BELT

Ribbed-top conveyor belt, designed to prevent backslip in carrying wet mate-

These Nuts are oversize

These Nuts are undersize

These Nuts are the right size

Circle Ⓑ Bolts and Nuts . . . both standard and special . . . are under constant development by a fully-equipped research staff. New developments in metallurgy and manufacture result in ever-better products for Buffalo Bolt customers.

BUFFALO BOLT COMPANY

North Tonawanda, N. Y.

SALES OFFICES IN PRINCIPAL CITIES

Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

...they are CIRCLE Ⓑ NUTS

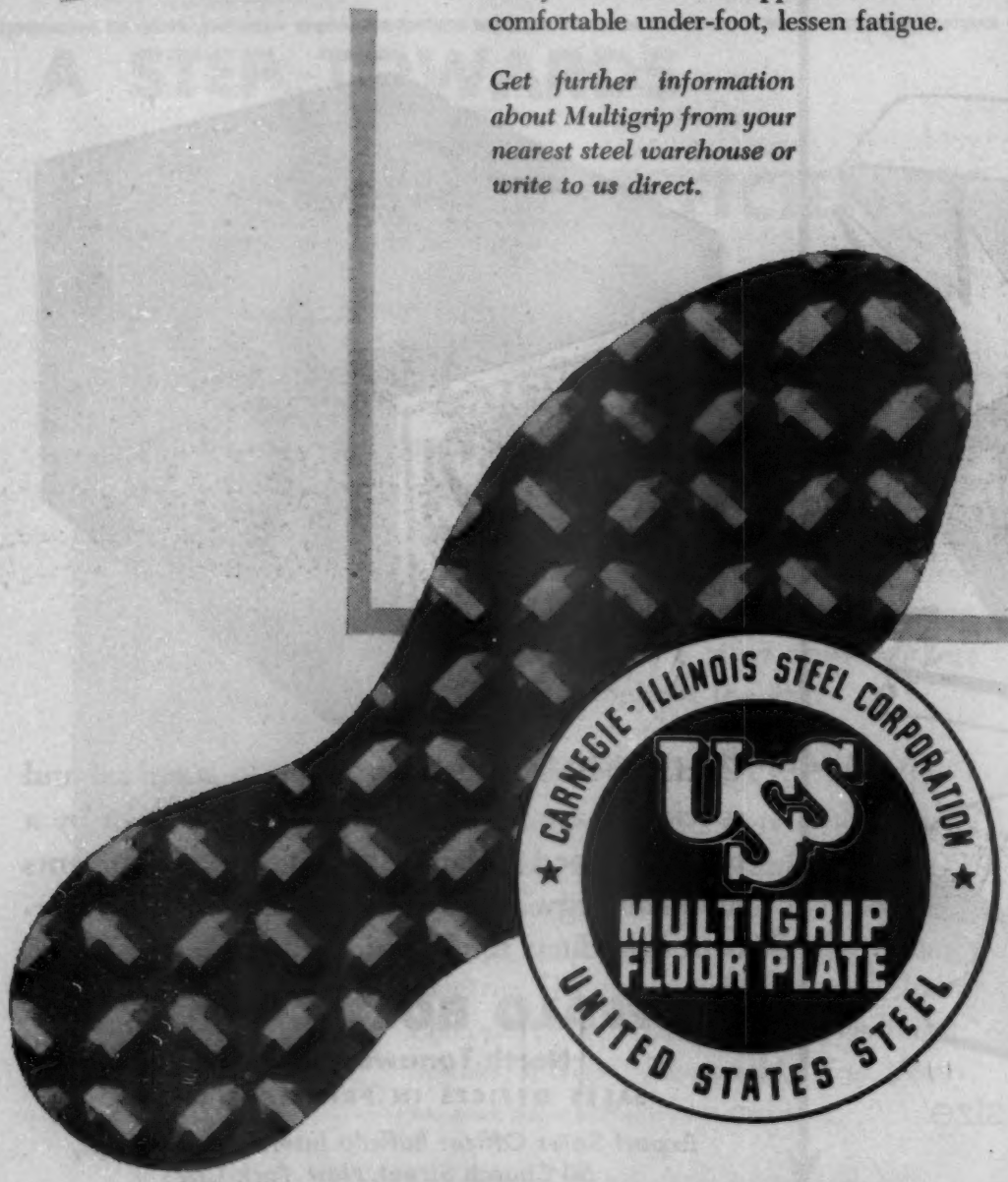
An Oppossum

is safe with his feet off the ground...

. . . but a worker must keep his feet firmly on the ground if he is to do his work with complete safety. You can keep injuries due to slips and falls to a minimum in your plant by installing U·S·S Multigrip Floor Plate.

Multigrip offers skid resistance and traction in every direction, wet or dry. Workers start and stop, promptly . . . safely. And the flat-topped risers are comfortable under-foot, lessen fatigue.

Get further information about Multigrip from your nearest steel warehouse or write to us direct.



CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York
8-537

UNITED STATES STEEL

rials up steep inclines, features chevron-shaped ribs ¼ inch higher than the belt surface. The ribs serve as barriers, trapping the water and preventing backwash down the belt on incline operations up to a 20-deg. angle. The ribbed cleats are said also to increase belt life substantially by reducing the wear inflicted by back-slipping loads. The curved ribs are closely spaced to overlap each other in order to provide a smooth return run of the belt over idlers. Belt has a 5-ply rubberized fabric body, and a ¼-in. top cover in addition to the ribs. Made in widths of 30 to 48 inches, and in lengths to customers' specifications. Goodyear Tire & Rubber Co., Akron.

•

CONCRETE BREAKER

Medium-weight concrete breaker, Model B67, is built for general demolition work, both vertical and horizontal. Its design incorporates a safety latch on the throttle valve handle to prevent accidental operation of the hammer when moving the breaker about on the job with live air on the line. It is equipped with a lubricator of sufficient capacity for several hours' operation on one filling. Weighing 63 pounds, it is 23 inches long, and can be fitted with chucks for either 1½- or 1¼-in. hexagon tools. Gardner Denver Co., Quincy, Ill.

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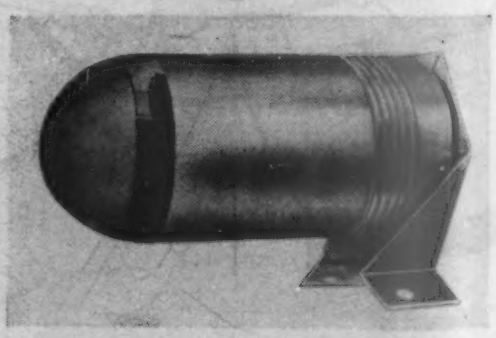

PHOTO-ELECTRIC LIGHT CONTROL

Photo-electric controls for warning lights on smoke stacks and other high structures, turn on automatically at 35 and off at 55 foot-candles. Model 61305 is rated to control 500 watts of incandescent lamp load; Model 61306 controls 3000 watts. Both operate at 120 volts, 50 to 60 cycles. A time delay of 15 seconds is incorporated in the controls to prevent their being turned off at night by lightning or any passing lights or beams that

focus on them momentarily. Maker states that they are unaffected operationally or physically by wide temperature extremes, high humidity, direct desert sunlight, or any other weather hazard. Fisher-Pierce Co., 72 Ceylon St., Boston.

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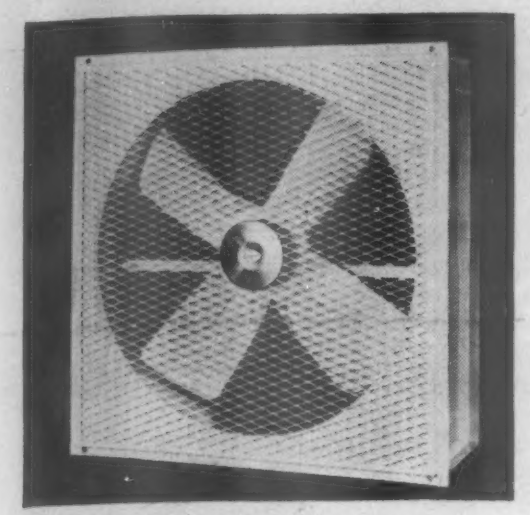

AIR CIRCULATOR

Thirty-inch air mover, powered by a ¼-hp. motor, has a capacity of approximately 7000 c.f.m., according to the manufacturer. It is furnished with a safety grille, and has over-all dimensions of 36x36 inches. V. E. Sprouse Co., Inc., Columbus, Ind.

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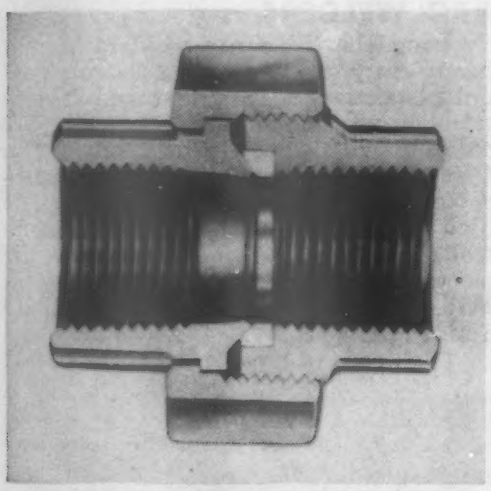

UNIONS

Line of brass seat, ground joint, steel unions, designed for steam pressure up to 250 pounds, provides sizes from ¼ to 1 inch. The ¼- to ½-in. unions are made from bar steel; the ¾-in. is a combination of bar and forged steel parts; the 1-in. union is made of all forged steel parts. Capitol Mfg. & Supply Co., Columbus, Ohio.

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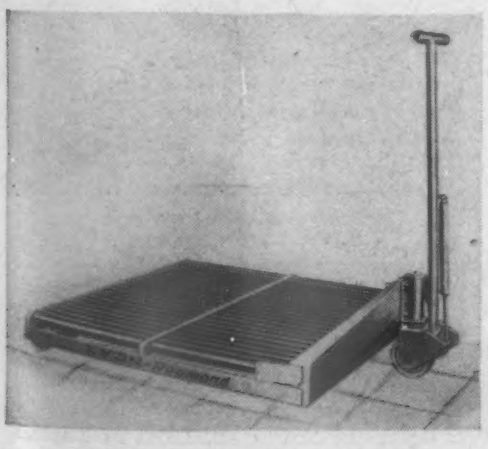

PALLET-SWITCHING TRUCK

Special truck, with rollers instead of conventional platform, is used to move

NOW *you have 3 to choose from*

The NEW Jones & Lamson BC-7 Bench Optical Comparator offers you a choice of three different table assembly combinations. This enables you to choose the model best suited to your needs, and obtain . . . *at lowest cost . . . the finest in Optical Comparators.* They are designed to cover an almost unlimited range of inspection work — from products of the tool room through mass production parts and products.

Our engineers are specialists, their knowledge of fixtures, methods and Comparator equipment, qualify them to study your inspection problems and make recommendations that will improve your profit picture. They have for others. Call for their service today.

New **MODEL BC-7A**

With a 12″ plain table. Commonly used for inspecting such parts as knitting needles and sinkers on a production basis, by comparing the magnified shadow of the object with a master outline. It can handle objects up to 3″ diameter, at magnifications ranging from 5 to 125.

New **MODEL BC-7B**

With a 14″ table that can be compounded for inspecting objects with helices. It is for inspecting, by comparison, screw threads and other irregular shaped parts. Objects up to 3″ diameter and 11″ between centers can be inspected at magnifications ranging from 5 to 125.

New **MODEL BC-7C**

The 16″ table, equipped for making lateral measurements, can be compounded for projecting objects with helices. A great variety of tools and industrial products up to 3″ diameter and 11″ between centers, can be inspected at magnifications ranging from 5 to 125.

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Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

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Good men tried to steer it straight—nudging, urging, pushing, forcing—cussing. But it was determined to go off in its own erratic way . . . a path that led it quickly to the scrap heap.

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CUTS HANDLING TIME

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1536-A

empty pallets from inside a freightcar to a roller conveyor for movement to warehouse. The truck can be moved about inside a freightcar or motor truck so that palletized loads can be made up from goods being received. When the pallet is loaded, truck is moved to the doorway where a conveyor is set up leading into the warehouse. Pallet is easily pushed onto the conveyor from the rolls on the pallet truck. Handles standard 48-in. pallets on a double row of rollers on 2-in. centers. Loads up to 4000 pounds. Lyon Raymond Corp., 4975 Madison St., Greene, N. Y.

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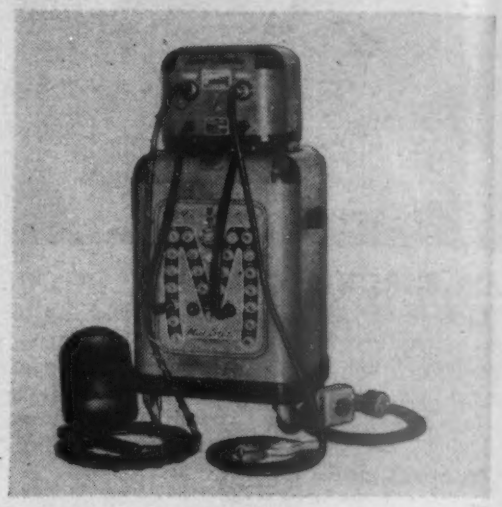


ARC WELDERS

Two models of a.c. arc welders are for heavy-duty use, 200- and 300-amp. output respectively. They feature an electrical circuit said to hold the welding arc constant with selective heat settings in 1-amp. steps, through a special air-cooled induction-type transformer. The high frequency circuit with remote control at the electrode holder is used for electronic fluxing and oxide dispersal. Mid-States Equipment Corp., 2429 South Michigan Ave., Chicago 16.

•

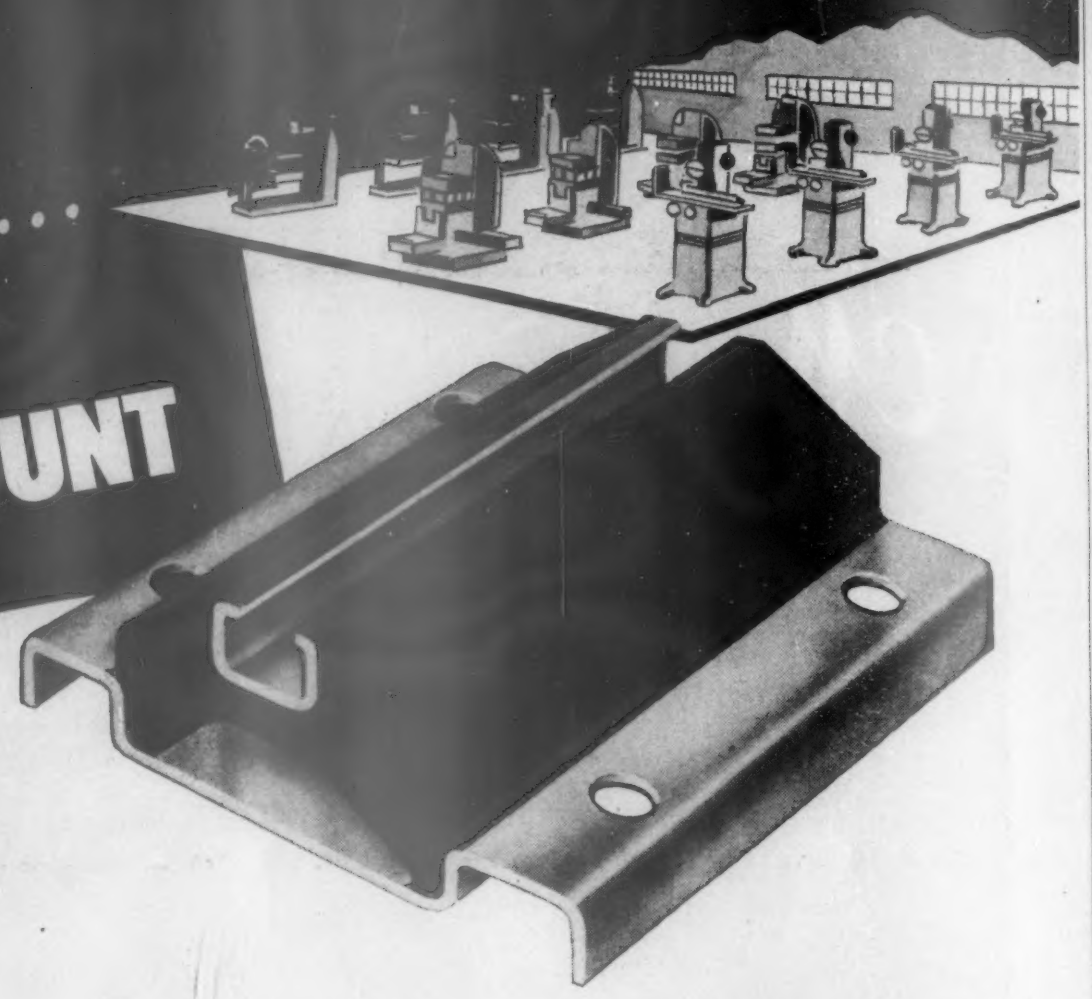
BALANCER

Used for suspending all types of portable tools weighing up to 10 pounds, Model 7072 balancer can be adjusted by a spring trigger located on the shaft. Cable comes out of the bottom of the balancer, in line with the suspension eye. Worn cables can be replaced by inserting through

Now . . .

with the NEW . . .

LORD CHAN-L-MOUNT



TYPICAL APPLICATIONS

- Pumps
- Air Compressors
- Blowers
- Business Machines
- Motor Generators
- Stationary Engines
- Shakers
- Air Conditioners
- Refrigerators

Various Bulletins available on Vibration Control Mountings, Flexible Couplings and Bonded Rubber Products. For applications providing vibration isolation regardless of direction of disturbing forces, Bulletin No. 106; for applications isolating vibration but not subject to intense shock, Bulletin No. 104; for applications involving transient shock loads in addition to vibration, Bulletin No. 103; Flexible Couplings, Bulletin No. 200-C; Shockmounts, Bulletin 400.

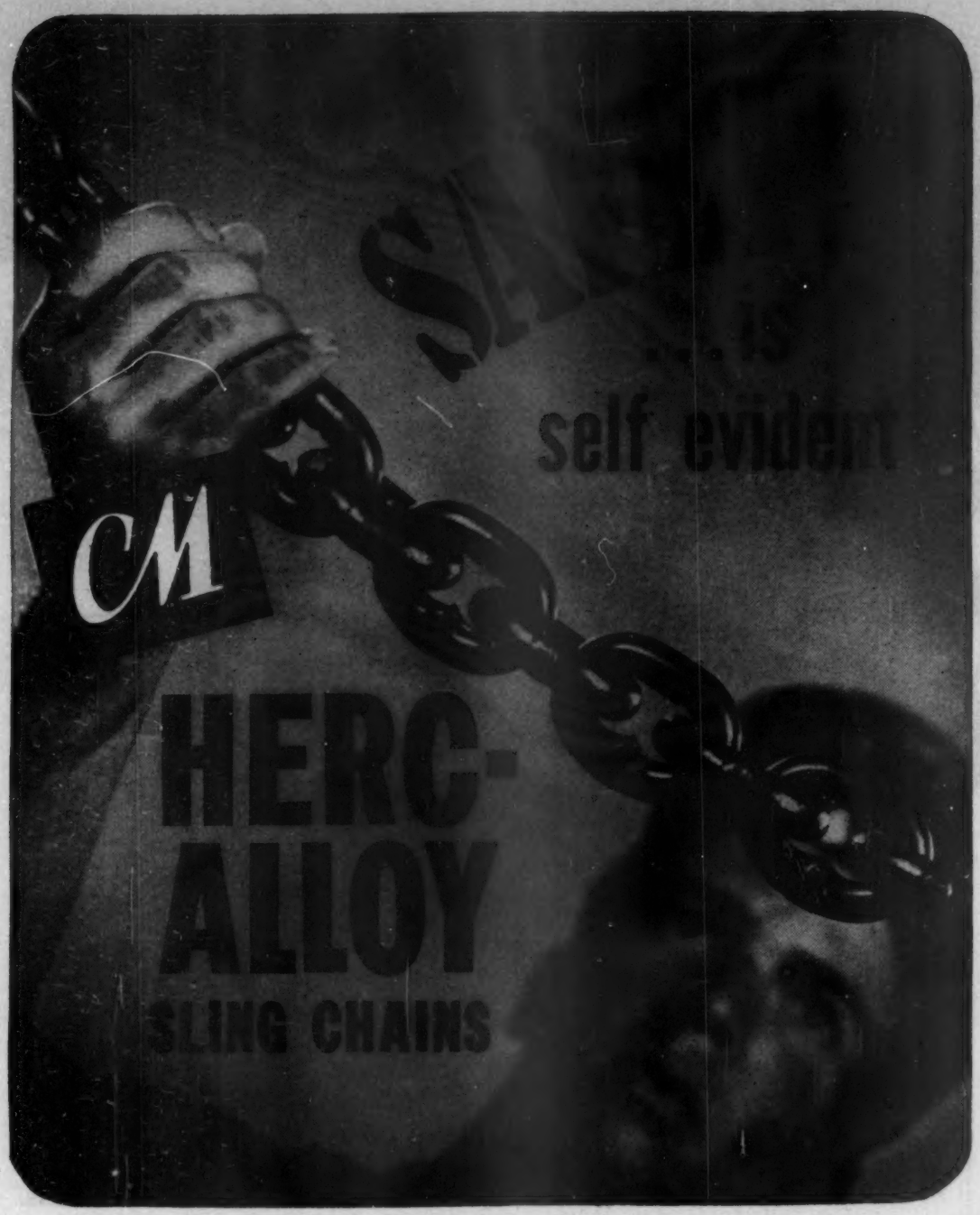
Vibration Control is easily accomplished with Lord Chan-L-Mounts. Vibration in the mounted machine is effectively controlled . . . and neighboring machines protected from transmitted vibration.

Chan-L-Mounts may be used for a wide variety of light and medium weight machines. There are no special fixtures, no holes to drill. The channel holds the bolt head firmly in place and the nut is quickly tightened with a single wrench. The flexing element is designed to control vibration caused by occasional shock load and impact as well as that of normal operation. A substantial section of soft rubber beneath the supporting channel protects against metal-to-metal bottoming . . . the rigid, one-piece base prevents spreading under load. Minimum stress on rubber-to-metal bond means longer life.

Lord Chan-L-Mounts are available in convenient sizes . . . ready for installation. A modest inventory of Chan-L-Mounts gives you ready-to-use vibration control when you need it, where you need it. Write for Bulletin 300.

LORD

Vibration Control



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- America's *first* alloy steel sling chain... first to bear a serial number.
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- Every chain is individually tested and accompanied by a certificate of registration.
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- HERC-ALLOY Chains should *never* be annealed.
- HERC-ALLOY Chains are lighter...stronger... easier to handle...outlast ordinary chains 4 to 5 times...cost less on the job.

HERC-ALLOY...the chain you can *SEE* is safe

● A simple visual inspection* is all that is needed to determine the continued serviceability of a HERC-ALLOY Chain. That's why more and more of the important companies are standardizing on HERC-ALLOY...because HERC-ALLOY Chains are immune to unseen dangerous crystallization...because you can see when a HERC-ALLOY Chain needs repairs or replacing.

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bottom opening into drum and rewinding. Standard equipment includes 6 feet of preformed wire cable, rubber bumper, and cable clamp for adjustments at any level. The Aro Equipment Corp., Bryan, Ohio.

•

VACUUM CLEANER

Powered by a ½-hp. motor mounted on self-lubricating ball bearings, small portable vacuum cleaner, Model 101 Tornado, weighing 29 pounds, develops a suction with a waterlift of 47 inches. Motor is mounted in an aluminum housing containing an air filter. Machine is said to be quiet in operation; there is no outside filter bag; tank is mounted on cast aluminum base equipped with four large casters. Breuer Electric Mfg. Co., 5100 Ravenswood Ave., Chicago 40.

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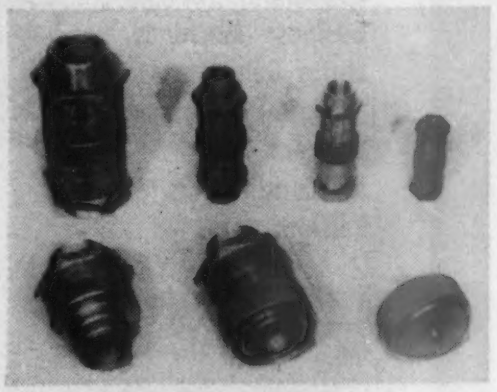

COUPLINGS

Automatic shutoff upon disconnection and instantaneous flow upon connection is accomplished by series of couplings known as the 1300 Series, according to manufacturer. Available with the valve in either or both halves of the coupling. When used together, these valves are mutually activating to open when connected, and close when disconnected. A valved coupling may be used with an open nipple, in which case the nipple end opens the valve upon connection. Roylyn, Inc., 718 West Wilson Ave., Glendale 3, Calif.

•

CONDENSATE RETURN SYSTEM

Constructed on a steel base with an 18-, or 30-gal. tank receiver, condensate return system for steam heating boilers and steam generators has an automatic float switch and a bronze-fitted turbine pump, check valve, and strainer. The ¼-, ⅓-, ½-, or ¾-hp. motor is equipped with an automatic overload cutout switch. The pump, a non-pulsating turbine type, is self-priming, does not vapor lock or steam bind. Maximum conden-

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PUSH TO START

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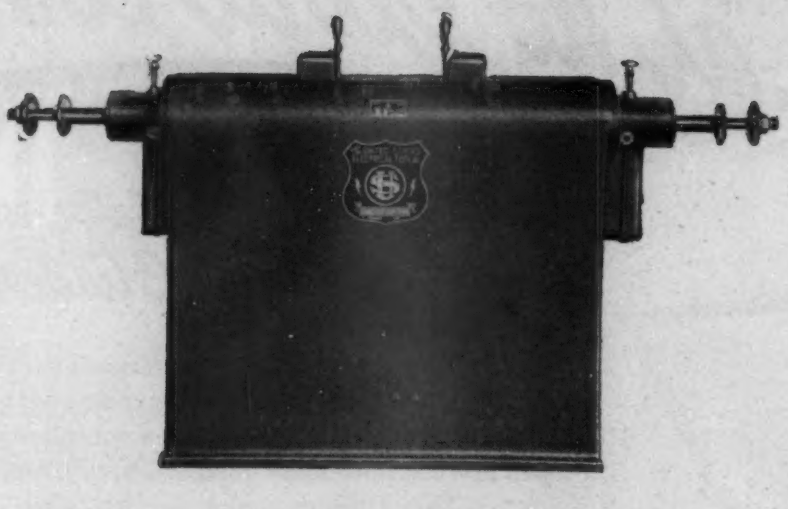

NEW MODEL 110
DOUBLE SPINDLE HEAVY DUTY
BUFFER and POLISHER

One of the Greatest Innovations to Add Efficiency and Ease of Operation

Combination Switch and Brake Automatically Stops the Wheel Spindle When Switch Is in "Stop" Position

Designed primarily for the polishing and burnishing trades because Model 110 eliminates cycle changing equipment and waste in power transmission. Also useful for numerous other purposes in industry. TWO CHROME MANGANESE STEEL SPINDLES mounted on heavy duty ball bearings driven by separate motors in base, operated together or separately.

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The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO

sate temperature is 180 deg. F. Capacities from 2000 to 12,000 square feet of radiation, E.D.R., with pump ratings of from 3.0 to 18.0 g.p.m. are available. Wayne Home Equipment Co., Inc., Fort Wayne, Ind.

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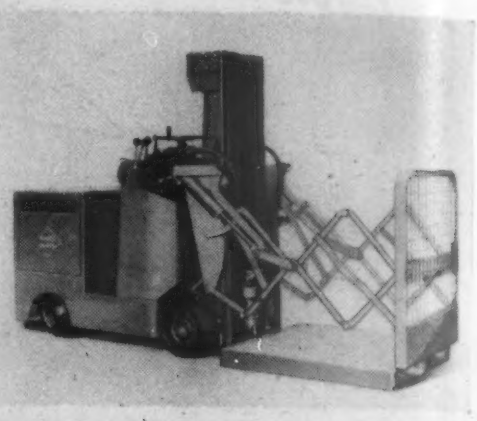

PALLET RETRIEVER

Attachment for standard fork trucks has a load handling or stablizing mechanism consisting of two hydraulically actuated pantagraph-type rams which terminate in a screen frame that remains in fixed positions with respect to the load. Rams are self-adjusting to fit and follow the contour and vertical or lateral motion of the load, while the truck with the pallet backs away and withdraws the pallet from beneath the load. The Elwell-Parker Electric Co., Cleveland.

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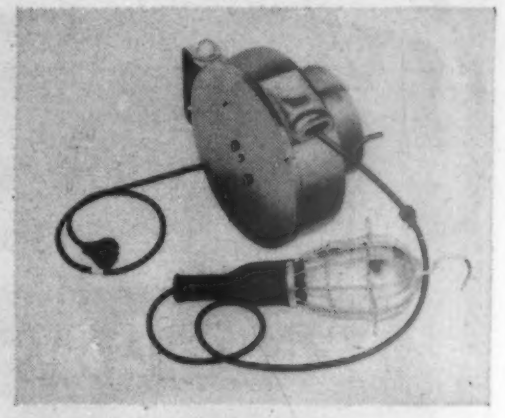

ELECTRIC CORD REEL

A universal mounting bracket permits installation of "Self-Wind" electric cord reel on ceiling or wall. Cord may be plugged into any convenient outlet. Swivel action of mounting hinge permits reel to swing freely within 180 degrees. Winding mechanism keeps cord under constant tension when withdrawn, and trigger on the reel locks cord at any length desired. Reel housing has specially designed cord outlet to provide level winding, prevent kinking. Available in 25- and 45-ft. lengths. Aero-Motive Mfg. Co., 1803 Alcott St., Kalamazoo, Mich.

•

ROLL HANDLER

Power truck with a horizontal arm for lifting, transporting, and tiering heavy rolls of paper makes use of the hollow center or core of the roll. Hand-lever control aligns the machine with the roll and inserts the arm into the core, moving the truck forward so the weight rests on the arm. The upright frame at the truck's front may be tilted forward or back, facilitating the maneuver and making the roll secure as it is being transported. Load carrier has an upward reach of 11 feet from the floor to maximum height of arm, and capacity to

How Will You Have YOUR Tubing?

If *you* manufactured caulking nozzles, you'd solve most of your production problems on your purchase order! You'd merely specify OSTUCO Tubing, formed and fabricated to your own blueprint requirements, and OSTUCO engineers and craftsmen would turn out the finished parts that would simplify assembly operations.

Threading, Angle Cutting, Shaping, Flattening . . . these and a host of other production problems are being solved daily through the use of OSTUCO production-assistance. You can get the complete story, without obligation, by writing to the nearest Sales Office. Find out today how OSTUCO Tubing can cut your production time and costs.

WHAT'S YOUR PRODUCT?

HAND TRUCKS?

If you manufactured hand trucks, you could slash production costs by having OSTUCO provide tubing produced to your specifications, with the difficult jobs of bending, flattening and piercing already completed. Whatever your product, there's a good chance that OSTUCO Tubing can help produce it in less time, at lower cost.

BUS SEATS?

Bending, flattening, piercing and trimming . . . all four of these complicated fabricating and forming operations are handled by OSTUCO in producing a better bus seat frame for a nationally-known manufacturer. If your production costs are a problem, better turn to tubing—OSTUCO Tubing —for the solution.

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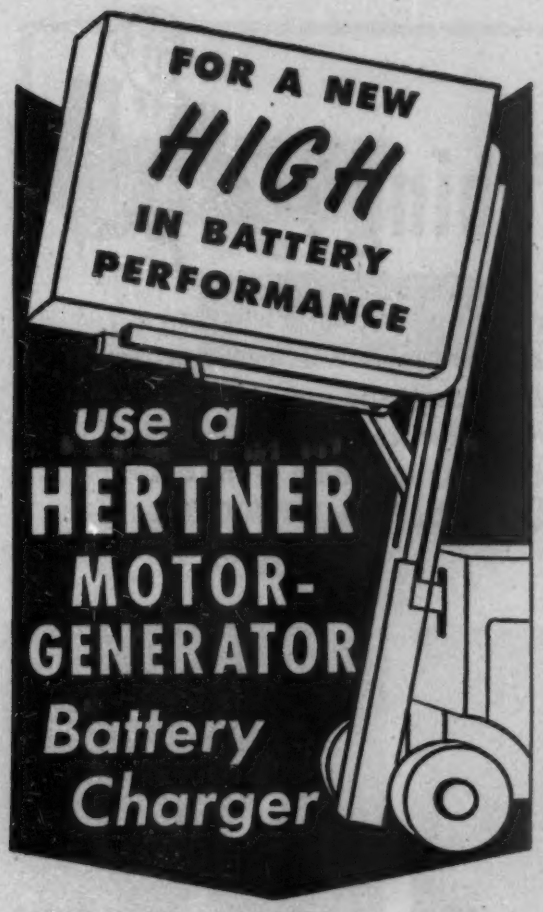

FULLY AUTOMATIC

1. AUTOMATIC control of charging rate.
2. AUTOMATIC cut-off for each fully charged battery.
3. AUTOMATIC shut-down and disconnect of charging current in event of power failure, and automatic re-start upon resumption of power.
4. AUTOMATIC protection against reversal of current.
5. OVERLOAD PROTECTION to both motor and generator.

For further information consult your local electric truck representative.

Mail us the coupon for Bulletin 104 describing Hertner Type "K" single-circuit chargers, or Bulletin 108 describing Type "K" multiple-circuit chargers.

3-Circuit Charger Control Panel

Hertner

MOTOR-GENERATORS
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handle a roll weighing as much as 4750 pounds. The Elwell-Parker Electric Co., Cleveland.

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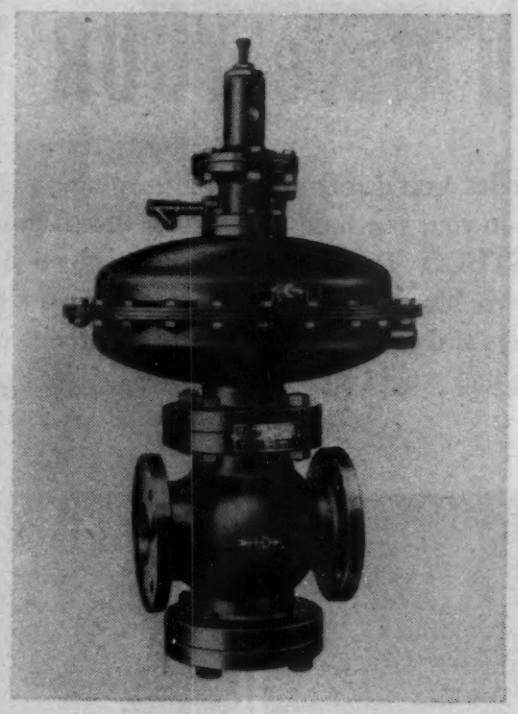

GAS REGULATOR

Said to control pressure within a fraction-of-an-inch water column, even with large variations in flow, 5000 Series gas regulator provides regulation whenever the controlled fluid may come in direct contact with the diaphragm. Valves may be used on either reducing or back pressure service for any control pressure up to 100 p.s.i. Fluid pressure from the outlet side of the valve is applied to the under side of a large diaphragm. Hammel-Dahl Co., 243 Richmond St., Providence 3.

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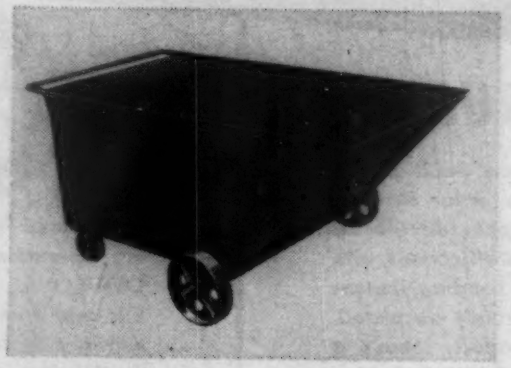

DUMP TRUCK

Designed originally to catch turnings from screw machines, hand dump truck is suitable for holding scrap, chips, or refuse. It is constructed of heavy sheet steel, reinforced with flange along the top edge, with ⅝-in. round rod iron handle welded to the body. Top measures 25¾x45 inches; bottom is 25¾x27 inches; depth is 17½ inches; over-all height is 23 inches. Can be furnished higher or lower on special orders. Equipped with two 8-in. steel wheels and two 4-in. metal swivels. Palmer-Shile Co., 16007 Fullerton Ave., Detroit.

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VACUUM GAGE

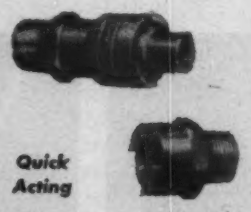
Helicoid vacuum gage, the dial graduated zero to 30-in. mercury vacuum in 0.2-in. increments, has barometric pressure readings from 29 to 31 inches. Zero is atmospheric pressure at sea level. Changes in pressure will, therefore, affect the accuracy of the gage, and inaccuracy may be considerable if vacuum

DALLETT'S

'Dalbo'

COUPLINGS and AIRLINE FITTINGS

ALL *"DALBO"* Couplings are machined from solid bar brass or steel. Steel couplings are thoroughly rust-proofed, and are rigidly tested to meet Dallett's specifications. "DALBO" is the accepted standard in many industries.

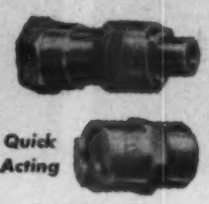


PIPE ENDS

Machined from solid bar steel and brass; steel is thoroughly rust proofed. Quick-lock sleeve. Male threads in six sizes: from ¼" to 1¼".

HOSE ENDS

Quick locking sleeves prevent accidental uncoupling. Grooved with four serrations on shank for standard hose clamps. Made in six sizes.



PIPE ENDS

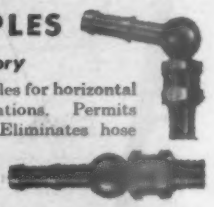
Quick-lock sleeve, will not accidentally uncouple. Requires a quarter-turn to lock or unlock. Female threads made in six sizes: from ¼" to 1¼".

Write for Bulletin 300

SWIVEL NIPPLES

New Airhose Accessory

Straight and angle type nipples for horizontal or vertical working operations. Permits quick changing of tools. Eliminates hose kink. Increases efficiency.



AIR VALVES

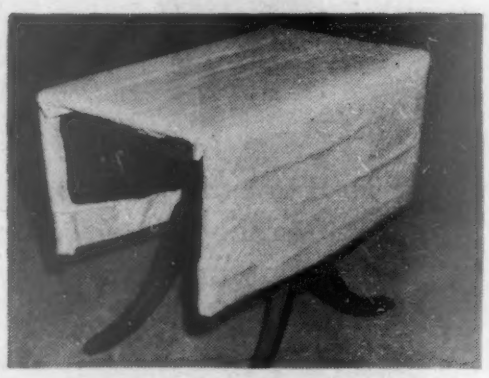
For use on horizontal outlets. Angle lets hose line fall away from valve and eliminates kinking Valve has only three parts:—body, plug and handle. Precision built for long, trouble-free service.

BLOW GUNS

All of Dallett's Blow Guns are made from brass. Available in button or lever style, in ¼" and ⅜" sizes. Extensively used wherever air is employed.

THE DALLETT COMPANY
Mascher at Lippincott St., Philadelphia 33, Pa.
Manufacturers of Pneumatic Tools and Accessories
Distributors
in Principal Cities throughout the United States, Canada, Europe, and South America

Cloud-soft KIMPAK shields this handsome dispenser from damage during shipment. Photo courtesy Temprite Mfg. Co., Inc.



Surface Protection — Drop-leaf table. Photo courtesy Phoenix Chair Company.

Flotation Packaging — Mercury bottle. Photo courtesy F. W. Berk & Company.

*Kimpak** Float Packaging

bundles of protection for every product you pack

Ship confidently and save—thanks to reliable, low-cost KIMPAK* creped wadding. A versatile, efficient cushioning material, KIMPAK provides protection in packaging for the smallest, most delicate items to heavy and bulky products. Made in a variety of types, thicknesses and backings to suit your particular needs. You'll find a specification of cushiony KIMPAK to meet every requirement of the Four Basic Methods of Interior Packaging—Surface Protection, Blocking and Bracing, Flotation Packaging and Absorbent Packaging.

Soft, flexible and feather-light—KIMPAK adds little weight or bulk to shipments. It is made either liquid absorbent or liquid repellent. Highly resilient, it effectively withstands shock and vibration. Spotlessly clean, KIMPAK improves the appearance of any package. No wonder so many fine products are wrapped for market with KIMPAK.

Free book for you. Call or write your local distributor for this fact-filled booklet on better packaging methods. He is listed in the Classified Phone Directories. Or, if you wish, merely mail this coupon.

KIMBERLY-CLARK CORPORATION
Creped Wadding Division, Neenah, Wis.

Please send me the free KIMPAK booklet on better packaging methods. FM-648

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REG. U.S. PAT. OFF. & FOREIGN COUNTRIES

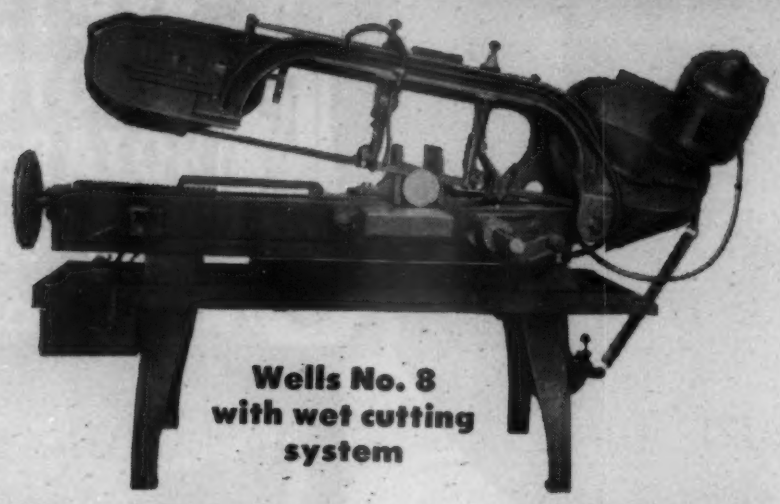
A PRODUCT OF Kimberly Clark RESEARCH

CREPED WADDING

*T. M. Reg. U. S. & Can. Pat. Off

there is *No Lost Time*
WHEN YOU CUT WITH A . . .

WELLS METAL CUTTING BAND SAW



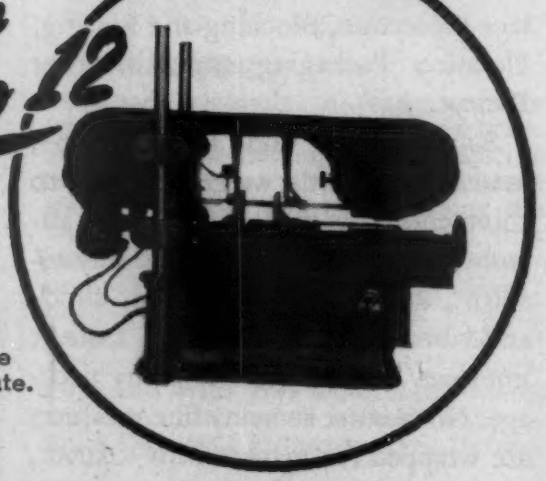
Wells No. 8 with wet cutting system

You'll get the job done faster with a Wells Band Saw because the cutting action is continuous. There is no wasted motion. Service records in hundreds of leading plants prove that Wells Saws reduce cutting time, yet they are versatile and economical. Ask your dealer for a demonstration or write direct.

Specifications—Wells No. 8

CAPACITY:	Rectangular	8″ x 16″
	Special Guides	5″ x 24″
	Rounds	8″ O. D.
MOTOR		½ H.P., A.C. or D.C.
SPEEDS		Selective; 60, 90, 130 feet per minute
WEIGHT		Approximately 665 pounds

the new Wells no. 12



The revolutionary new Wells No. 12 features an automatic hydraulically controlled cutting cycle and controlled blade pressure. It will handle rectangular shapes up to 12″ x 16″ and rounds to 12¾″ O. D. It operates at selective speeds of 60, 90 and 150 ft. per minute.

Wells SAWS
Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1414 TAYLOR ST., THREE RIVERS, MICHIGAN

gage is in a room pressurized by forced draft. An external micrometer pointer adjusts for differences in pressure. The dial reads counterclockwise to prevent any confusion with a pressure gage. Helicoid Gage Div., American Chain & Cable Co., Inc., Bridgeport, Conn.

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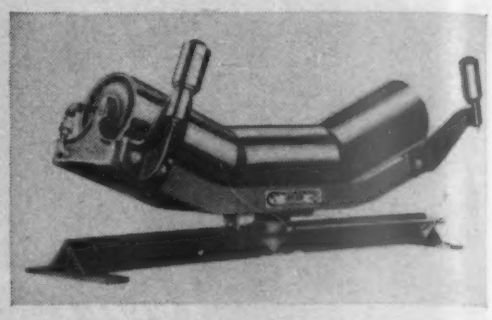

BELT CONVEYOR IDLER

Self-aligning belt conveyor idler, for troughed, flat, and return belts, is interchangeable with practically all standard idlers, claims manufacturer. Heavy-duty Timken bearings on a 1¼-in. swivel shaft, grease pipes extended to the side, and hydraulic fittings are standard equipment. Maker states that it is not necessary to cut into the deck plate to mount the troughing idlers. Continental Gin Co., Industrial Div., Birmingham, Ala.

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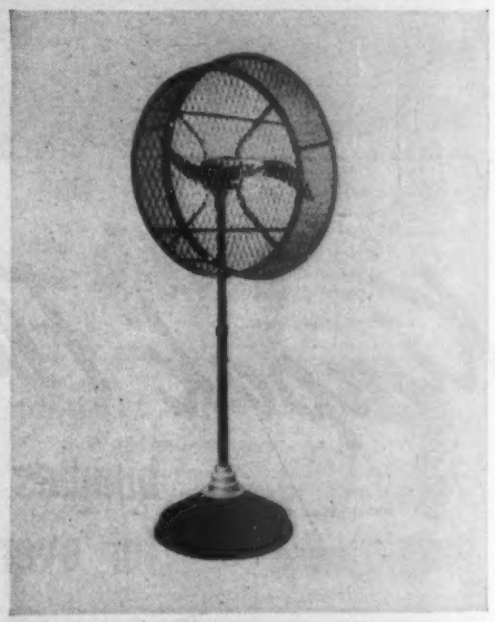

AIR CIRCULATOR

Known as Model M-351 Man Cooler, air circulator is designed for use where mass movement of air is essential to employee comfort and efficiency. The ⅙-hp. capacitor-type G.E. motor, dynamically balanced to eliminate vibration, has two speeds, 1050 and 730 r.p.m., with a locked rotor amperage on high speed of 7 amps., low speed 1¾ amps. Motor is of the closed type, and can also be used on 230 volt, single speed, by reconnection. Push-button switch mounted on the safety guard can be removed and remounted on any wall for remote control. Fresh'nd-Aire Co., 221 North LaSalle St., Chicago.

•

CHECK VALVE

Made of stainless steel, check valve for liquids or gases operates on a pressure drop of 6 pounds. Small in size (approximately 2 inches in over-all length), it is tested against leakage on assembly under 50-lb. pressure. Has large "self-washing" seat area, soft rubber washer, and rounded edge. Available with ⅜-in. NPT outlet and 3/9-in. 45-deg. flare

FOR CADMIUM PLATING
Cadmium Anodes
Udylite Salt No. 1
Udylite Salt No. 2
Udybrite

FOR CHROMIUM PLATING
Lead Alloy Anodes
Chromic Acid

FOR COPPER PLATING
Copper Anodes
Bright Copper

FOR NICKEL PLATING
Nickel Anodes
Bright Nickel
Nickel Salts
Nickel Carbonate
Nickel Chloride
Boric Acid

FOR SILVER PLATING
Silver Anodes
Silver Cyanide

FOR TIN PLATING
Tin Anodes
Sodium Stannate
Sodium Acetate

FOR ZINC PLATING
Zinc Anodes
Bright Zinc
Zinc Oxide
Caustic Soda

ELECTRODES
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Steel

CLEANERS

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TEST SETS

CYANIDES

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BRUSHES

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ANODE BAGS

CHROME LOCK TUBES

BALL ANODE CONTAINERS

PLASTIC TUBING

MISCELLANEOUS CHEMICALS

JUST NAME WHAT YOU NEED! HERE'S...

Everything from Anodes to Zinc salts

IN PLATING AND POLISHING SUPPLIES

Here—under one roof—is everything you need for modern, high-efficiency plating and polishing operations. *And that spells real convenience for you!* It saves your time, it simplifies your records, and means speedier service when you make a habit of ordering all your plating supplies from Udylite Corporation. All Udylite supplies are laboratory-tested to assure maximum serviceability and efficiency . . . *with satisfaction guaranteed.*

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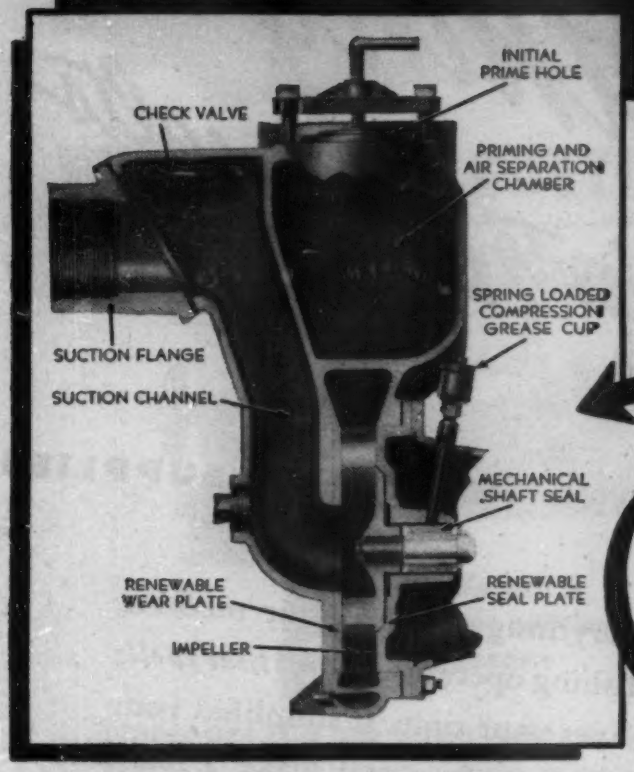
Represented in Principal Cities

Look into the Industrial Pump You Buy



See Why
GORMAN-RUPP LEADS THE FIELD

Here is why the NEW GORMAN-RUPP INDUSTRIAL PUMPS enable industry to more fully benefit from the advantages of self-priming centrifugal pumps.

GORMAN-RUPP'S IMPROVED DESIGN brings self-priming to its highest stage of development — no valves, no vents, no mechanical devices — no foot valve as in conventional centrifugal pumps.

ENGINEERED TO MEET INDUSTRIAL DEMANDS. These new industrial pumps reduce installation costs necessary for expensive flooded suctions for conventional centrifugals. They automatically renew their prime — handling vapor, fluids, and fluids of a gaseous nature. Abrasive solutions cause no trouble.

FURNISHED IN A WIDE VARIETY OF MODELS AND DRIVES. Capacities from 50 to 1200 GPM. The New Bulletin 8-IP-11 shows clearly why Gorman-Rupp Industrial Pumps are superior for your job.

STARTLING NEW PRIMING RESULTS

Here's the Inside Story

PRIMING ACTION — Note how the air and water leave the impeller periphery at the cut-water point and then pass into the priming chamber where the water again flows downward to re-enter the impeller periphery, mixing with air, discharging upward and separating.

PUMPING ACTION — The priming cycle has been completed. Note (see arrows) that the water is flowing upward through both volute channels and out through the discharge. Unlike other pumps — no valve required to stop recirculation.

THE Gorman-Rupp Pumps GORMAN-RUPP COMPANY
MANSFIELD, OHIO

inlet, or with 3/9-in. NPT outlet and ½-in., 14 NPT flat flare inlet. Other sizes and threads from ¼ inch up available on special order. AMP Corp., 2921 Locust St., St. Louis.

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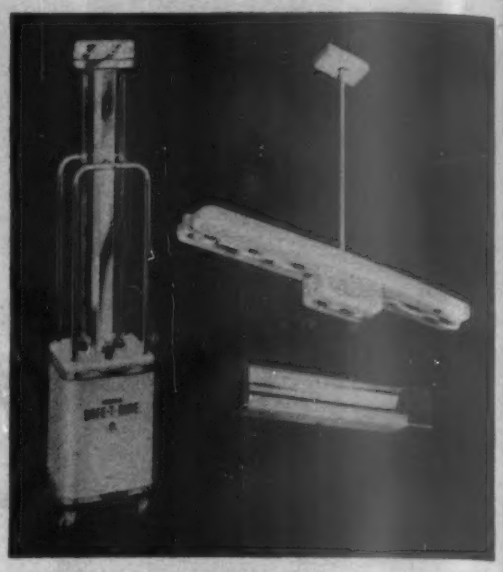

GERMICIDAL UNITS

Ceiling suspension unit, the ST2832, provides indirect germicidal irradiation to the upper air. Fixtures may be equipped with various types of burners depending upon the requirements of each particular room. Two windows in bottom of the fixture reflect the ultraviolet light when lamps are in operation, making it possible to see that they are lit. Wall model, ST2835, also available. ST2830 is a portable floor model, mounted on casters, and designed primarily for "fumigating" vacant rooms. Hanovia Chemical & Manufacturing Co., Newark, N. J.

•

STEEL PALLETS

Pallets, made of steel grating bars set on edge, have the bars, bottoms, side supporting angles, and lifting straps welded together. Designed for eight-way lifting by fork truck, all corners are rounded to prevent catching on materials in aisles. Furnished plain or with closure. Toteboxes of same design also available. Kerlow Steel Floring Co., 222 Culver Ave., Jersey City 5, N. J.

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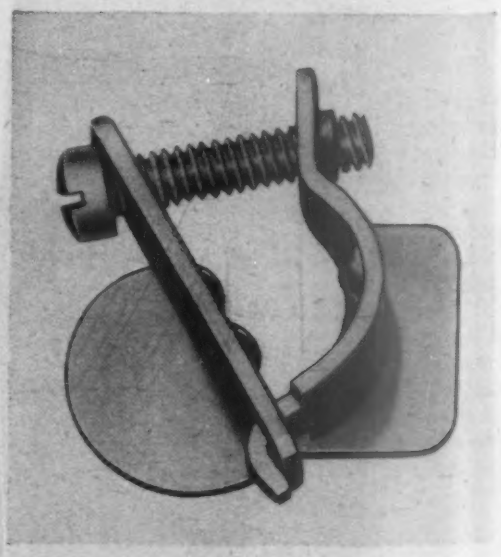


CONNECTOR

Called No. 9049 "EZ" connector, device for connecting non-metallic sheathed cable to outlet boxes is formed of electro-galvanized pressed steel, and is of the "rock-in" type. It has a hook that protrudes from the lower plate up through a slot in the upper strap. When

Dust rides this Cooling Slipstream

OUTSIDE and AWAY

COLOR STREAMERS trace the fan-driven airstream in this action photo. See how it draws out heat from the radiating fins that provide over 150% more cooling surface—without trapping dust and dirt. Even in a virtual dust bowl of flour, cement, or sand, the Sealedpower ventilating system provides no place, no way for dust and dirt to choke and clog. Only Sealedpower Motors offer this *outside* fin construction.

DOWNTIME IS DESIGNED OUT . . . OF C-W SEALEDPOWER MOTORS

THIS EXCLUSIVE DESIGN gives you years and years of cool, clean operation on the dirtiest jobs without time out to clean out dirt-and-dust-traps common to other totally enclosed motors. Even airborne lint that packs and clogs is no problem. It can be cleared from the air grille of the fan-cowl with a whisk of a brush, while the motor is running.

FRAME IS RUGGED CAST IRON to resist the effects of moisture and corrosive conditions like those in textile finishing and chemical plants. There is no steel to rust.

AVAILABLE IN NEW RATINGS . . . 3 to 40 hp at 1800 rpm. Write for Bulletin SL-300-2 giving full details of this unique Crocker-Wheeler Sealedpower Motor. Also, get complete descriptive data on the general C-W line of AC and DC motors and generators, and flexible couplings.

CROCKER WHEELER

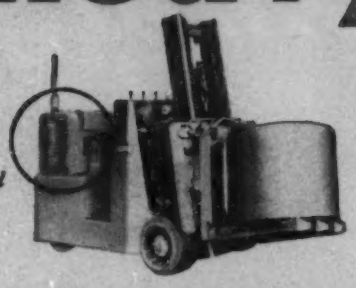
ELECTRIC MANUFACTURING COMPANY, AMPERE 3, N. J.

A Division of The Joshua Hendy Corporation

Branch Offices: Boston, Chicago, Cincinnati, Cleveland, Los Angeles, New York, Philadelphia San Francisco, Pittsburgh, Washington, D. C. — Representatives in principal cities.

QUALITY MOTORS AND GENERATORS SINCE 1888

heavy loads need READY-POWER



Ready-Power-equipped Baker truck

There's plenty of power to handle heavy loads all day when trucks are equipped with Ready-Power gas-electric Units. Dependable electric power, generated right on the truck chassis, assures smooth, positive handling. Models are available to meet practically all requirements. Convert any make truck to Ready-Power; specify Ready-Power Units on new truck purchases.

THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan

loomwire is inserted in the connector, the upper strap moves up and engages on the upper portion of the hook. This forces the integral flange, which is "rocked-in," through the knock-out of the box, to position itself off center. Manufacturer states that neither the top nor bottom integral flanges can be pulled through the knock-out without first removing the cable. National Electric Products Corp., Chamber of Commerce Bldg., Pittsburgh 19.

•

END DUMP TRUCK

Truck, for handling and dumping sand, castings, scrap, stampings and other heavy materials, fits any fork or lift truck. It can be built with rubber or metal wheels instead of legs for moving around heavy machinery and through narrow aisles. Made of heavy steel plate, all-welded construction, reinforced with heavy angles. Rockers, geared to the truck, are self seating and smooth operating, according to manufacturer. Available in two sizes, ½ or 1 cubic yard, which weigh 600 and 750 pounds respectively. Palmer-Shile Co., 16007 Fullerton Ave., Detroit 27.

•

POWER DRIVE

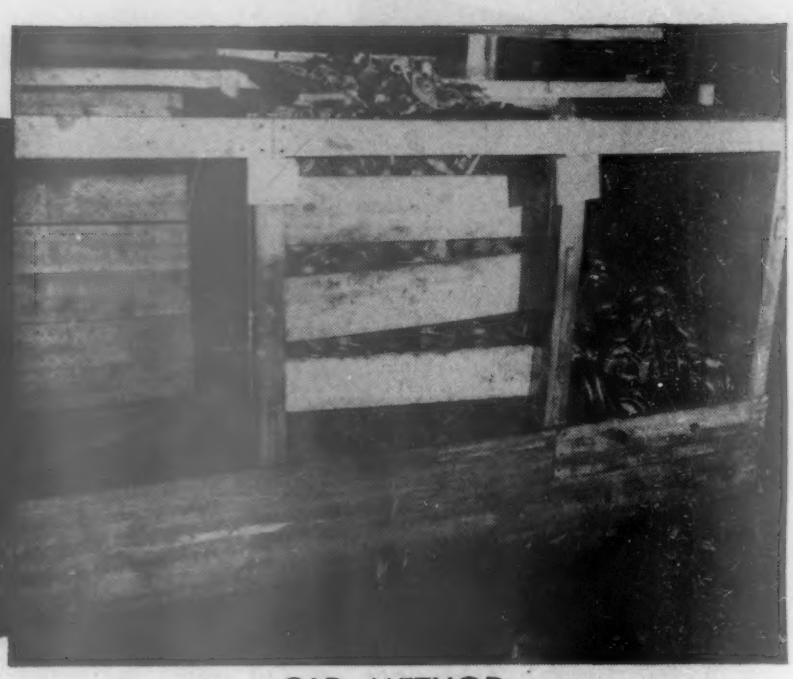
Called the Ridgid Porta-Power Drive, lightweight power drive, for operating hand pipe cutters, threaders, and reamers, weighs 100 pounds. It has a three-jaw lathe-type scroll chuck in front and a self-centering workholder in rear which turns with the pipe. Chuck wrench ejector removes any forgotten wrench; a bumpproof start and stop switch, and permanent sealed-in lubrication are also features. Plugs into any 110-a.c. socket; motor is reversible. The Ridge Tool Co., Elyria, Ohio.

•

GATE VALVES

Two types of 100-lb. brass gate valves, No. 410 screwed-end, in sizes from ¼ to 2 inches, and No. 1320 solder-joint valve, sizes ⅜ to 2 inches, are non-rising stem valves. The upper portion of the body is cylindrical, which is said to increase resistance to pressure and to reinforce the seats against wedging action of the

Pittsburgh Cargotainers save $35. per carload handling castings at Westinghouse



OLD METHOD

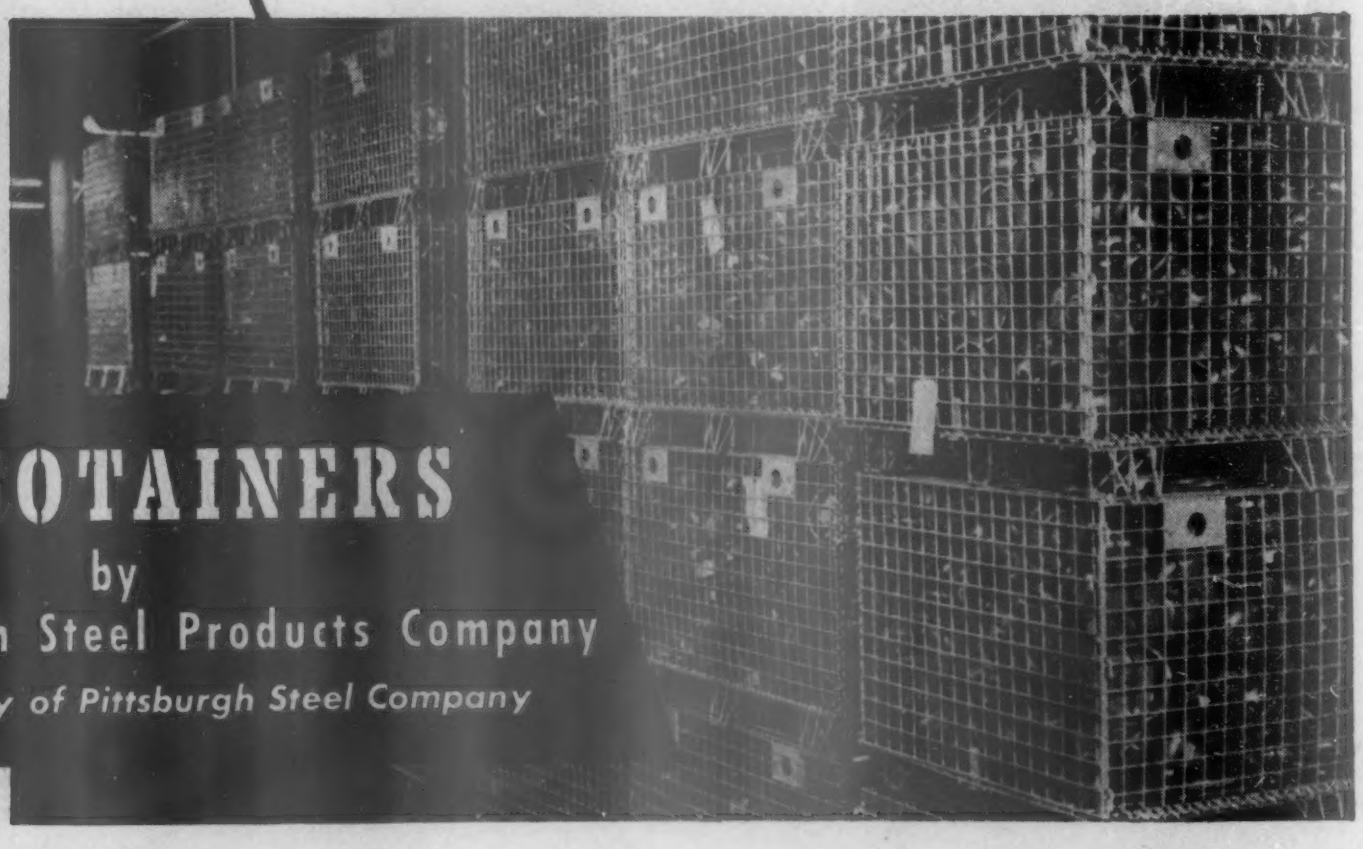
You can save with Cargotainers just as Westinghouse is doing at its Small Motors Division, Lima, Ohio. Formerly, bracket castings were unloaded by hand from railroad freight cars into skidboxes. These were carried to the storeroom by electric truck and unloaded by hand into wooden bins. This took one man 48 hours—it cost $41.00.*

Now the castings are received in collapsible wire Cargotainers. The same electric truck picks up the containers of castings from the freight car and unloads it in only 3½ hours at a cost of merely $6.00—a net savings of $35 per carload. In addition Pittsburgh Cargotainers have made possible several other savings—the old wooden bins are out and castings are now kept in Cargotainers tiered four-high until used—a big savings in floor space. Breakage in the Westinghouse plant has been eliminated as has the demurrage on freight cars. Better inventory and accounting is possible. Work is scheduled without delay. These are all extra savings not included in the $35 saved on handling alone.

If you want to save money on your materials handling, it will pay you to investigate Pittsburgh Cargotainers. Write to Pittsburgh Steel Products Company, 3257 Grant Building, Pittsburgh 30, Pa. for information.

****From "Better Handling Nets Important Savings" Factory Management & Maintenance, February 1948.***

MODERN CARGOTAINER METHOD



CARGOTAINERS

by

Pittsburgh Steel Products Company

Subsidiary of Pittsburgh Steel Company

GUESS-WORK HERE COSTS MONEY

Specify Grant Speed Reducers —
A type, a ratio, correct for your job

Figure in long-term costs and you'll specify Grant Speed Reducers for *every* application! Made to precise standards by gear experts, *Grant Reducers* have extra quality features that save you maintenance dollars.

- Radial thrust ball bearings
- Oil seals
- Gears of high-test bronze
- Worms of chrome vanadium steel
- Immediate delivery

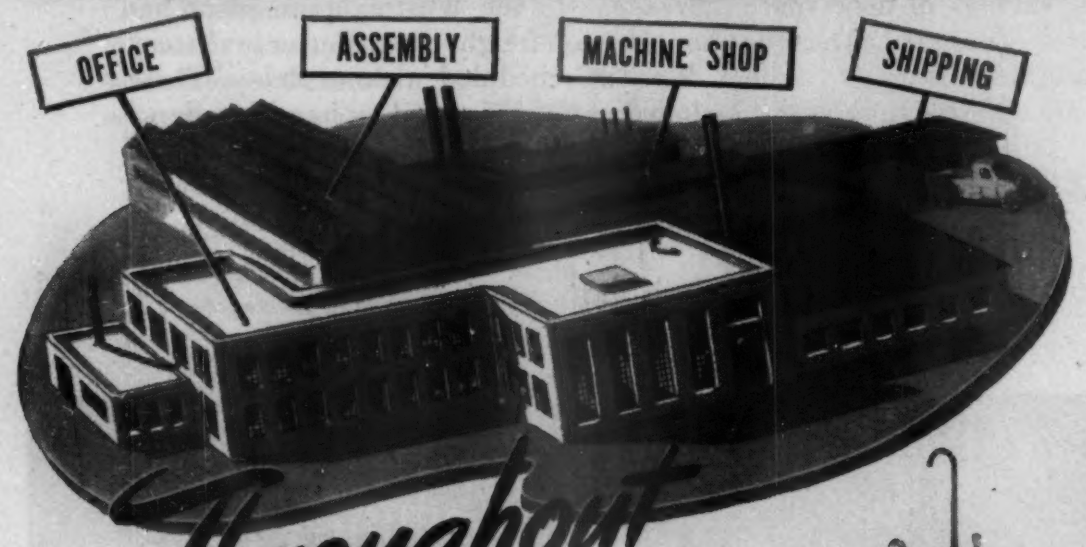
Free Catalogue illustrating and describing the Grant Line available on request. Write for your copy today.
Grant Gear Works, Inc.,
165 West Second St.,
So. Boston 27, Mass.

1877 – GEARED TO INDUSTRY'S NEEDS FOR 71 YEARS – 1948

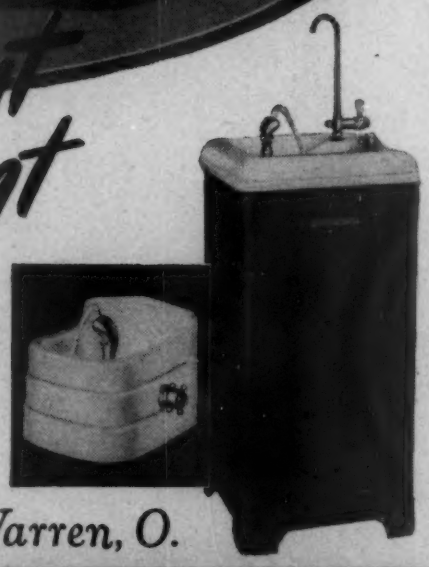
Grant
SPEED REDUCERS

7 gear arrangements—hundreds of ratios

OFFICE ASSEMBLY MACHINE SHOP SHIPPING



Throughout the plant



A plentiful and dependable supply of cool, refreshing drinking water is a "must" throughout your plant. Halsey Taylor Drinking and Cooler Fountains have helped promote the health and convenience of workers in plant or office.

The Halsey W. Taylor Co., Warren, O.

• Write for latest literature.

HALSEY TAYLOR
Coolers & Fountains

F-3

disk, preventing distortion. The screwed valves are suitable for use on low-pressure condensate lines, exhaust steam lines, and low-pressure process steam lines, in water, steam, and hot-water heating, gas, and fuel-oil lines. Solder-joint valves are suitable for the same services, except for gas or fuel oil, because of the fire hazard involved when working with solder. Crane Co., 836 South Michigan Ave., Chicago 5.

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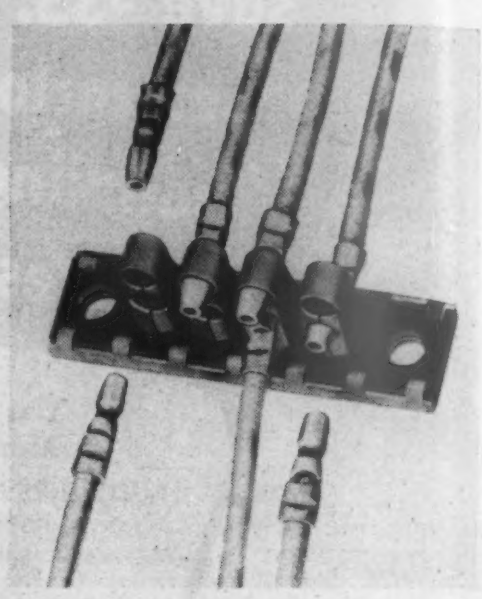

TERMINALS

Called "Shur-Plug," solderless plug-type terminals, for 16-14 wire size, provide a method of installing or replacing connections on leads in electrical equipment on machinery, appliances, and other devices. Application to the wire is accomplished by an AMP hand tool, pneumatic hand tool, or by foot or power press. The resulting connection has high electrical conductivity and corrosion resistance, states the maker. Suitable for stranded wire, terminals make plug-in connections with any standard female fitting. Aircraft-Marine Products, Inc., 1563 North 4th St., Harrisburg, Pa.

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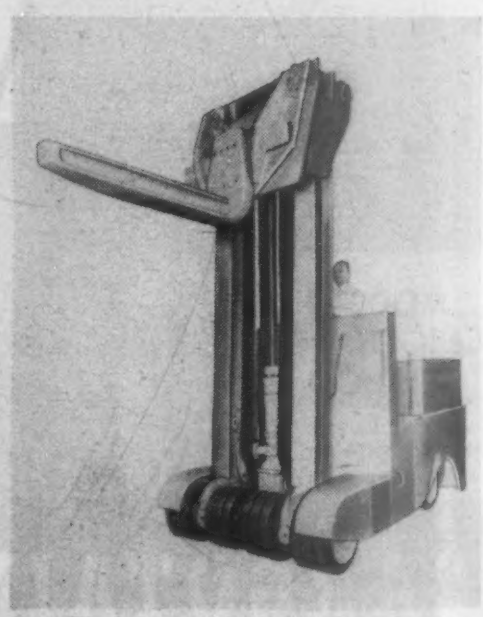
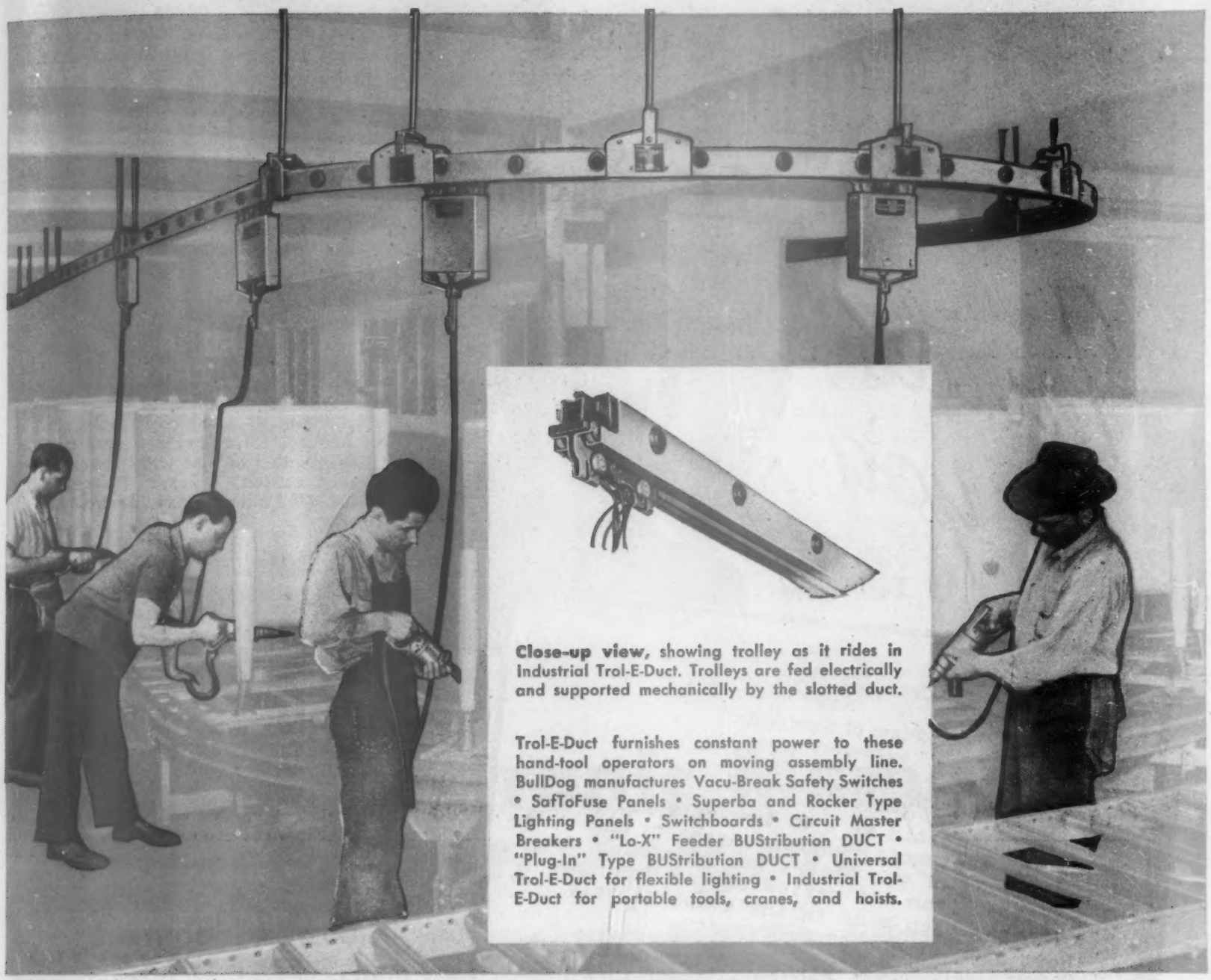


BATTERY-POWERED TRUCK

Twenty-ton ram-type electric power truck is designed to improve coil-handling during processing, storage, and shipping operations in steel mills and similar plants. It has an elevating height of 10½ feet, a lifting capacity of 20 tons, a maximum speed under load of 5 m.p.h., a 360-deg. rotating drive unit which permits operation in narrow aisles, and unobstructed driver visibility. Rated



Close-up view, showing trolley as it rides in Industrial Trol-E-Duct. Trolleys are fed electrically and supported mechanically by the slotted duct.

Trol-E-Duct furnishes constant power to these hand-tool operators on moving assembly line. BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panels • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution DUCT • "Plug-In" Type BUStribution DUCT • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, and hoists.

These trolleys save more than carfare

. . . considerably more, in fact!

You can fatten your wallet on the savings you get with BullDog Industrial Trol-E-Duct . . . and breathe easier, too, as production headaches walk out of your life.

Your outlet follows the job

BullDog Industrial Trol-E-Duct is a flexible electrical system. Current is carried by copper bars encased in insulated steel duct. Trolleys, moving along the continuous slot in the bottom of duct, transmit current from bus bars to portable electrical tools, cranes, hoists and other moving "loads." Since outlets (trolleys) move with the job, no lengthy extension cords clutter the floor and men work unimpeded.

Ideal for assembly lines

Electrical outlet problems for assembly lines are solved with BullDog Industrial Trol-E-Duct. The slot in the bottom of Trol-E-Duct casing is continuous through straight sections, fittings, around curves . . . a safe, smooth path for the outlet (trolley) which follows the worker and his job. Whether he operates a hand tool, a hoist, or even a crane, Trol-E-Duct makes the job easier, saves time, and increases production.

Call in a BullDog Field Engineer for data on this remarkable power distribution system. He'll be glad to advise you in any way. If you'd like, he can arrange to show you a similar installation near your own plant.

BullDog's Field Engineers welcome the chance to sit in on planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation and maintenance costs, as well as highest efficiency and reliability in actual operation. Why not take advantage of this pre-building service?

BULLDOG ELECTRIC PRODUCTS COMPANY
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD. TORONTO

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION

UNION PACIFIC

The Governor of California

Invites you . .

Earl Warren

EARL WARREN
GOVERNOR

State of California
GOVERNOR'S OFFICE
SACRAMENTO

To American Industry:

In California we are currently celebrating the centennial anniversaries of the beginnings of our State. We gain much inspiration from our review of the progress which has been made in the comparatively short span of one hundred years.

During the past eight and one-half years alone California's population has increased by 47 per cent and our industry and agriculture have risen to positions of great importance in the economic life of the nation.

Our tremendous reserves of natural resources and our strategic world trade position on the shores of the Pacific Basin assure California's continued progress in the years to come.

I am happy, therefore, to join in inviting you to investigate the opportunities for expansion which exist in the many communities of our State.

Sincerely,

Governor

★*One of a series of advertisements based on industrial opportunities in the eleven states served by Union Pacific Railroad.*

Unite with Union Pacific in selecting sites and seeking new markets in California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oregon, Utah, Washington, Wyoming.

★Address Industrial Department, Union Pacific Railroad
Omaha 2, Nebraska

UNION PACIFIC RAILROAD

Road of the Daily Streamliners

truck capacity of 25,000 pounds with a load of 92 inches long, 40,000 pounds with a load 42 inches long. Total weight of truck is 6500 pounds. The Yale & Towne Mfg. Co., Philadelphia.

•

CORRUGATED SKID

Designed for handling of heavy industrial loads, all-steel corrugated skid is of heavy steel all-welded construction. It is intended for use with power-lift or hand-operated trucks. Palmer-Shile Co., 16007 Fullerton Ave., Detroit 27.

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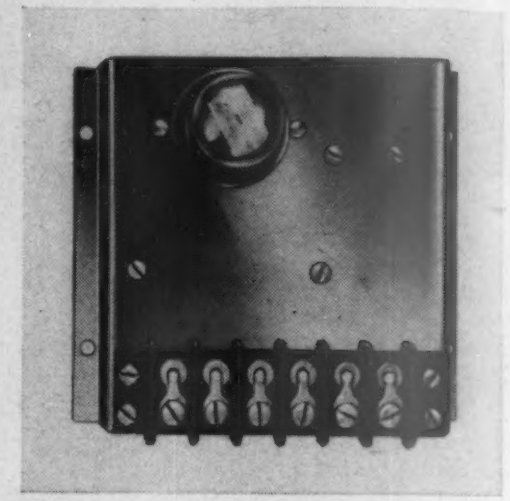

LIQUID LEVEL CONTROL

For electronic control of liquid levels, Model FE Faratron is 4½x4¾x3½ inches deep. All parts are mounted on the back of the plate, which, when extended, becomes both the housing and installing panel. The measurable power input is 15 micro-amps. This control operates in any conductive liquid in any container, states the maker. Two types available, for one-level operation, either high or low; or for two-level operation, both high and low. Lumenite Electronic Co., 407 South Dearborn St., Chicago 5.

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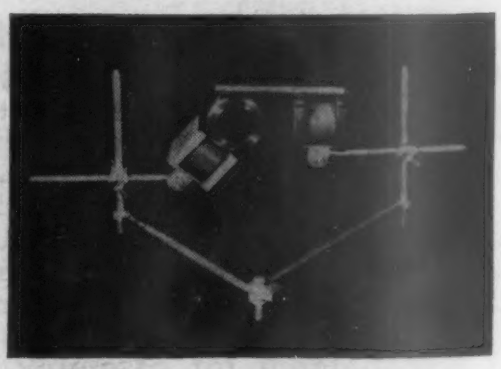


MAGNETIC WELDING POSITIONER

Designed for use when welding small parts or pieces, welding positioner, called Minute Man, consists of a *V* frame equipped with two permanent Alnico magnets. Two or more pieces of ferrous metal are gripped and held in virtually any position, for welding, soldering, or other joining operation. Magnets are 2x2x2⅛ inches with equal holding power

$149.50 Slightly higher West of Rockies

The Electronic Memory *Never Forgets*

Personnel Training Programs • Conferences • Speeches • Research Data • Departmental Instructions

America's leading Wire Recorder, the portable Webster-Chicago *Electronic Memory* is light in weight, easy to carry and use. Just plug it into an AC outlet to record and play back any sound.

Executives in practically every industry are using it to increase the effectiveness of their working hours. In the office, plant, laboratory or salesroom, the magnetically recorded wire can be replayed thousands of times without "forgetting" what was said, how it was said, or losing any of its original fidelity.

The recording may be retained indefinitely, replayed thousands of times. Yet, if you desire, you can erase simply by re-recording. The same wire may be used over and over again. A sensitive microphone and three spools of wire are supplied and can be stored in the detachable lid.

... Webster-Chicago, electronically pretested stainless steel recording wire is available in quarter, half and full hour spools—for best results insist on the recording wire with the W-C trade mark.

Mail the coupon, today, for your copy of the booklet describing many of the ways in which the Webster-Chicago *Electronic Memory* is serving executives.

This trade mark identifies the Electronic Memory Wire Recorder and genuine Webster-Chicago Recording Wire

WEBSTER-CHICAGO

Electronic Memory

Wire Recorder

by the makers of Webster-Chicago Record Changers and Magic Nylon Phonograph Needles

Webster-Chicago, Dept. E-2
5610 West Bloomingdale Avenue
Chicago 39, Illinois

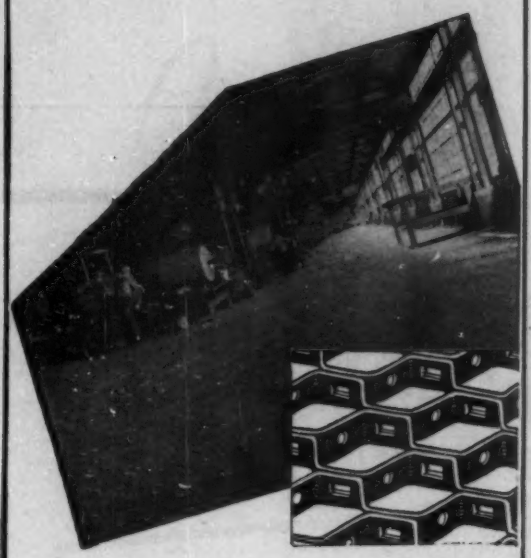
Mail a copy of "*The Electronic Memory for Commercial and Professional Use*" to:

Name_____

Address_____

City_____ **Zone**_____ **State**_____

IMPACT!
DOESN'T HARM THIS FLOOR



KLEMP
SURE FOOTED AS A CAT
HEXTEEL
Heavy Duty Surface Armor

IT IS ARMORED WITH

KLEMP HEXTEEL

Heavy Duty Surface Armor

Easy to install. Hexteel floors filled with concrete or mastic endure the shock of heavy materials dropped on their surface; and resist everyday wear equally well.

WRITE FOR HEXTEEL BULLETIN.

WM. F. KLEMP CO.

6616 S. Melvina Ave. Chicago 38, Ill.

on all four sides. They are mounted universally on the frame which has two 10-in. horizontal arms, and two 6-in. vertical arms. The du Mont Corp., Greenfield, Mass.

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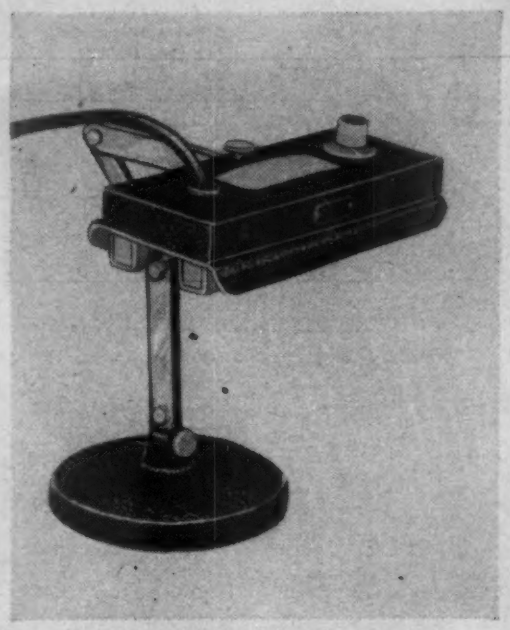


FLUORESCENT MAGNIFIER

Miniature fluorescent fixture with integral magnifier directs illumination from widely divergent angles of 350 foot-candles on the object being examined. Both eyes observe the object through the two-power lens mounted in the reflector between twin 5-in. fluorescent lamps. Since the point of observation is directly behind the light source, internal surfaces of holes and cavities can be seen, according to manufacturer. Stocker & Yale, 48 Birch St., Marblehead, Mass.

•

AIR COMPRESSORS

Two portable fractional-horsepower air compressors, designed to eliminate contact or contamination of the air with lubricating oil, are adjustable for different pressures. Model 17-C, powered with a ½-hp. electric motor, delivers 4.4 c.f.m. free air at 40-lb. pressure. The mechanism of this model is encased in a welded steel frame, and has twin air cleaners, accessible by loosening two cover screws. Model 8-C, with ¼-hp. motor, delivers 2.2 c.f.m. at 25-lb. pressure, and is equipped with a single air cleaner. American Brake Shoe Co., Kellogg Div., 97 Humbolt St., Rochester 9, N. Y.

•

SCALING HAMMER

Portable high-speed pneumatic scaling hammer is suitable for removal of splatter and excess metal after welding, beading, removal of rust, scale, and paint, core-breaking in small castings, gouging in pattern work, and similar operations. Manufacturer states that features in-

FOR GOOD LIGHT

where you want it most...

SYLVANIA-BIRDSEYE *SUPER SPOT* REFLECTOR LAMPS

These extremely high intensity lamps give a narrow beam super spot of light where you want it most. Foot candle intensities are of the highest ranges. At Sylvania Distributors, or write Sylvania Electric Products Inc., Lighting Division, Salem, Mass.

Send for free Sylvania Birdseye Booklet today!

SUGGESTED USES AND WATTAGES

Used on portables; also for close visual bench assembly or precision inspection. Used with flexible socket, it has many applications.	100 WATT, R-40
Narrow beam inspection lamp. Large bording jobs, tubs, mixing vats, pickling barrels, plating tanks.	150 WATT, R-40
Used on arc welding jobs for operation without hood raising; precision machine operation where socket is some distance from machine.	200 WATT, R-40
Excellent for parking and yard areas if protected from weather. Trackage and shunting areas. Interior paint jobs where regular portables cannot provide long beam.	300 WATT, R-40
While only a few applications have been given, hundreds of individual uses are well handled by this versatile lighting tool. In banks of 2, 4 or 6 these are being used by plant photographers, repair and maintenance men for a variety of plant lighting operations.	ALL R-40 SUPER SPOTS

WITHOUT EXTRA FIXTURES!

When you screw in a Sylvania-Birdseye Reflector Lamp you have a complete lighting unit—with built-in brilliant reflector.

WITHOUT COSTLY MAINTENANCE!

Reflectors on these lamps can't get dirty—they're inside, giving full service. Just wipe outside glass occasionally!

SYLVANIA ELECTRIC

MAKERS OF FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS; RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES

MISSISSIPPI RIVER MUD is this valve's regular diet

Raw, silt-laden Mississippi River water at 175 p.s.i. had quickly destroyed conventional type valves through abrasive action and corrosion of exposed working parts in Union Electric Company's Venice, Illinois Plant. Then, their own engineers and Stone & Webster Engineering Corporation selected Grinnell-Saunders Diaphragm Valves. These flanged, unlined valves with rubber diaphragms have already served several times longer than previous valves, and are still going strong.

YOU, too, may find your answer to valve troubles due to corrosion, contamination or suspended solids, in

GRINNELL-SAUNDERS DIAPHRAGM VALVES

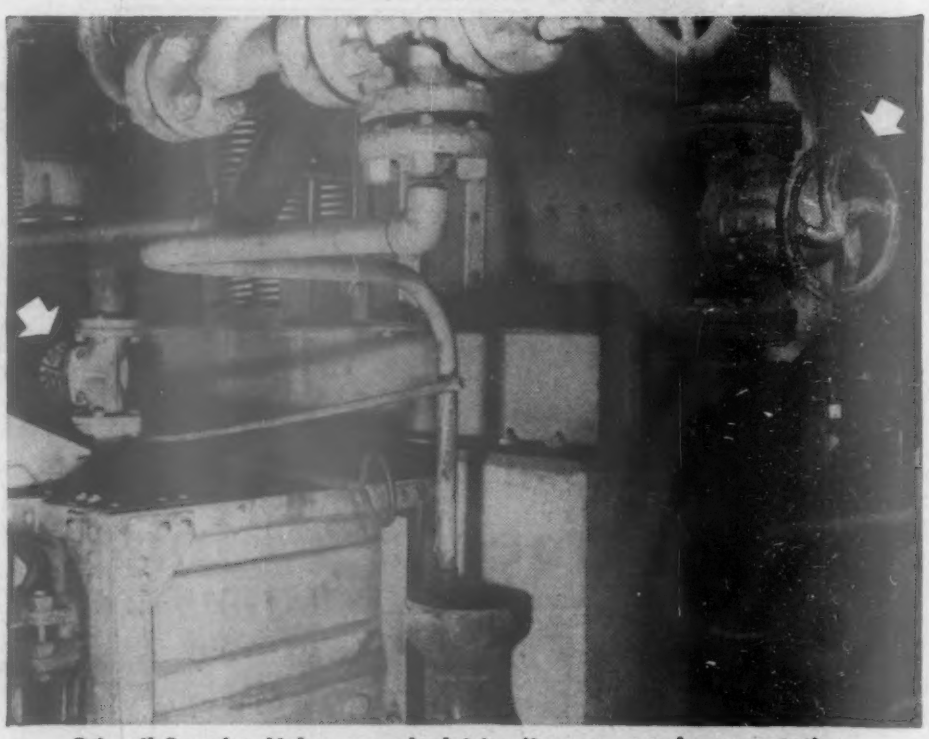
ISOLATED WORKING PARTS — The flexible diaphragm isolates working parts of the valve from the fluid, preventing contamination or corrosion.

CORROSION-PROOF LININGS — A selection of diaphragm materials and also body linings of glass, porcelain, lead, rubber or synthetics to suit your service requirements.

STREAMLINED FLOW . . . POSITIVE CLOSURE — Streamlined passage without pockets minimizes friction. Large area of contact of the diaphragm, plus diaphragm resilience, permit positive closure even when solids are trapped.

Write for catalog—Grinnell-Saunders Diaphragm Valves.

GRINNELL COMPANY, INC.
Providence 1, R. I.



Grinnell-Saunders Valves on ash sluicing lines in central power station.

BRANCH WAREHOUSES

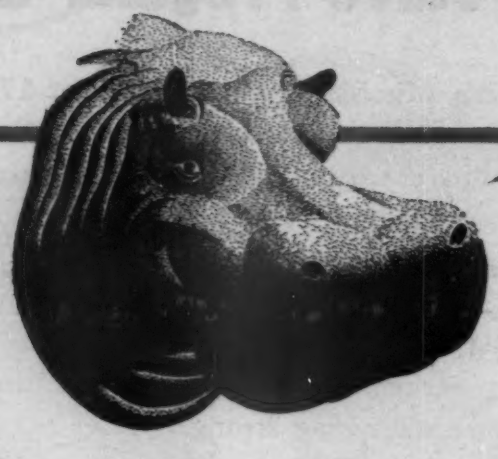
Atlanta 2, Ga.	Kansas City 16, Mo.	Philadelphia 34, Pa.
Charlotte 1, N. C.	Long Beach 10, Cal.	Sacramento 14, Cal.
Chicago 9, Ill.	Los Angeles 13, Cal.	St. Louis 10, Mo.
Cleveland 14, O.	Milwaukee 3, Wis.	St. Paul, Minn.
Cranston 7, R. I.	Minneapolis 15, Minn.	San Francisco 7, Cal.
Fresno 1, Cal.	New York 17, N. Y.	Seattle 1, Wash.
Houston 1, Tex.	Oakland 7, Cal.	Spokane, Wash.

GRINNELL

WHENEVER PIPING IS INVOLVED

Ask me for a tip about

Blocks and Sheaves!



MR. HIPPOPOTAMUS leads a tough life . . . so he has wisely developed a thick, armor-like skin to stand the gaff. And that suggests a pointer about blocks and sheaves. They, too, are bumped, banged, scratched and battered . . . exposed to mud, water and the elements.

So American Hoist engineers developed *armored construction*—super-rugged design that withstands the worst kind of punishment. The American line includes many types of industrial wire rope blocks, in sizes from 1½ to 250 tons. They're *worth specifying!*

only "American" Blocks and Sheaves
have ***armored construction***

Thick steel side plates, extended beyond sheave flanges, prevent breakage
Heavier pins and axles
Tough steel reinforcing straps
Sheaves of hard iron or alloy steel . . . thick flanges, precision shaped grooves
Self-lubricating bushings, bronze bushings, or anti-friction bearings
Oversize forged steel hooks and shackles

American Hoist
and DERRICK COMPANY

Plant No. 2:
So. KEARNY, N.J.

St. Paul 1, Minnesota

Sales Offices:
NEW YORK • PITTSBURGH • CHICAGO
NEW ORLEANS • SAN FRANCISCO

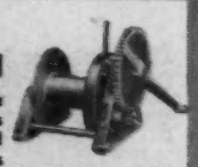
HOISTS • DERRICKS • HANDIWINCH • GENUINE CROSBY CLIPS

8301

Genuine **CROSBY CLIPS**

For fastening wire rope, use genuine CROSBY CLIPS—Made of highest quality drop-forged steel, hot dip galvanized. To make sure you get genuine CROSBY CLIPS, look for the famous Red-U-Bolt. All sizes—⅛ to 3 inches. Distributors everywhere.

AMERICAN HANDIWINCH



Gives one man the power of a crew. HANDIWINCH weighs only 95 lbs. Can be carried and set up anywhere; handles lifting, loading and pulling jobs up to 5 tons. All steel construction, cut gears. Ask your distributor.

clude low air consumption, easy feathering of throttle control in both lever and push type throttles, self-seating type of valve, and positive locking device back of head, which keeps valve mechanism sealed against air leakage and dirt. Master Pneumatic Tool Co., Inc., Orwell, Ohio.

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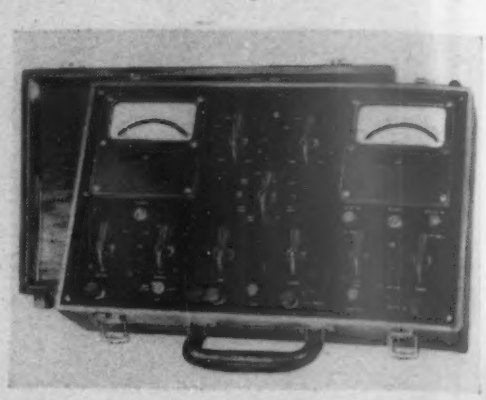


MULTI-COMBINATION METER

Designed for electrolysis and corrosion investigations and cathodic protection testing, both in field and laboratory, multi-combination meter is said to provide all instrumentation required to cover direct current and potential measurements necessary in this field. Includes a 3000 ohms-per-volt milli-volt/voltmeter covering ranges of 2 millivolts to 100 volts, full scale, and a 62,500 ohms-per-volt voltmeter with ranges of 100 millivolts to 20 volts, full scale; a potentiometer-voltmeter with galvanometer; a vacuum-tube voltmeter, battery operated, a milliammeter and ammeter with full scale ranges of 1 milliampere to 20 amperes; and a zero-resistance-type ammeter with capacity up to 2 amperes from self-contained batteries and controls. M. C. Miller, 1142 Emerson Ave., W. Englewood, N. J.

•

CORD REEL

Cordomatic Trouble-Lite reel, for temporary lighting requirements, can be installed by hanging it on a screw-eye anchored in the ceiling. The power cord is plugged into any outlet. May also be mounted on wall, or used as a portable unit. When used on a flat surface, three rubber feet provide scratch-proof protection. Reel revolves through 360 degrees in the direction of the pull. When wall-mounted, it rotates through 180 degrees, or may be locked into any of three fixed positions. Available with 20-, 25-, 40-, or 50-ft. cord lengths. Cordomatic Div., Vacuum Cleaner Corp. of America, 1724 West Indiana Ave., Philadelphia.

•

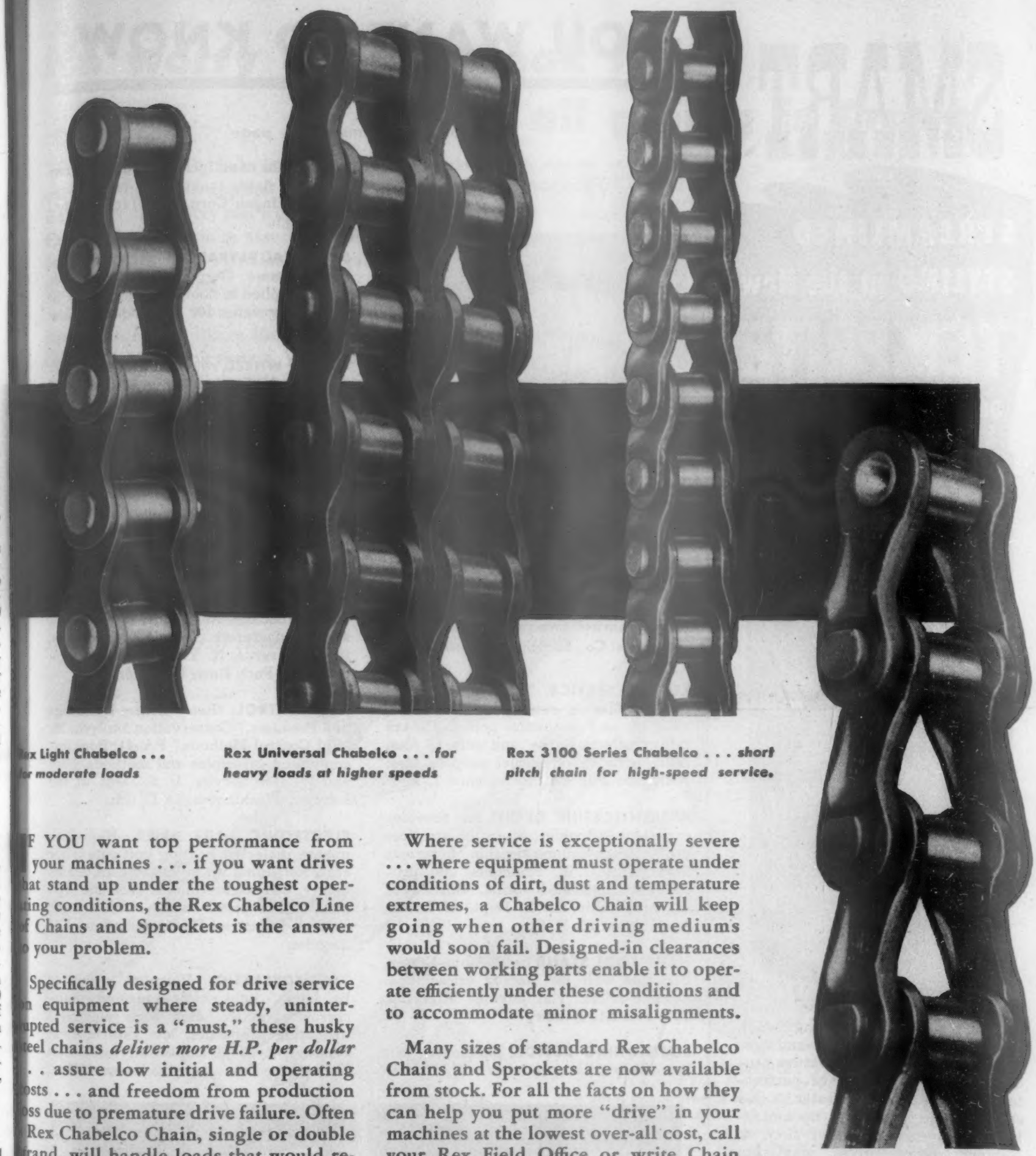
THREAD CHASERS

Eight sizes of unit thread chasers, used to straighten and restore battered or damaged threads on axle housing or shafts of trucks and tractors, are now available. One handle, TC-18, fits all eight sizes of dies. Owatonna Tool Co., 363 Cedar St., Owatonna, Minn.

•

CONVEYOR BELT FASTENER

Separable conveyor belt fastener, called the Hinged Flexco Belt Fastener, consists of a series of U-shaped galvanized plates bolted to each end of the belt and joined together with a flexible hinge pin. It is made in one size, for belts ⅜ to ½ inches thick. Flexible Steel Lacing Co., 4607 Lexington St., Chicago 44.



Rex Light Chabelco . . . *for moderate loads*

Rex Universal Chabelco . . . for *heavy loads at higher speeds*

Rex 3100 Series Chabelco . . . short *pitch chain for high-speed service.*

Rex Champion Chabelco *. . . for extra heavy loads*

IF YOU want top performance from your machines . . . if you want drives that stand up under the toughest operating conditions, the Rex Chabelco Line of Chains and Sprockets is the answer to your problem.

Specifically designed for drive service on equipment where steady, uninterrupted service is a "must," these husky steel chains *deliver more H.P. per dollar* . . . assure low initial and operating costs . . . and freedom from production loss due to premature drive failure. Often Rex Chabelco Chain, single or double strand, will handle loads that would require triple or quadruple strands in other types of chain.

Where service is exceptionally severe . . . where equipment must operate under conditions of dirt, dust and temperature extremes, a Chabelco Chain will keep going when other driving mediums would soon fail. Designed-in clearances between working parts enable it to operate efficiently under these conditions and to accommodate minor misalignments.

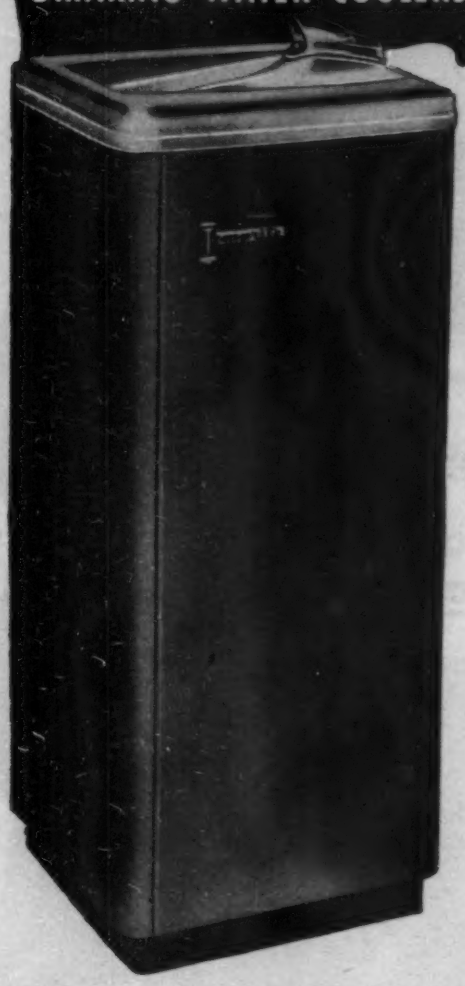
Many sizes of standard Rex Chabelco Chains and Sprockets are now available from stock. For all the facts on how they can help you put more "drive" in your machines at the lowest over-all cost, call your Rex Field Office or write Chain Belt Company, 1667 West Bruce Street, Milwaukee 4, Wis.

CHAIN BELT REX COMPANY

DRIVE AND CONVEYOR CHAINS

SMART

STREAMLINED
STYLING in the New
TEMPRITE
DRINKING WATER COOLERS



1. Smart, streamlined styling blends harmoniously into all surroundings. 2. Effortless finger-tip pressure produces a steady stream of perfect-temperature drinking water. 3. No spouting, no splashing, no annoying fluctuations in water flow. 4. Bubbler design gives maximum sanitary protection.

User Protected by Temprite's 5-Year Warranty Plan

All models meet requirements of the National Bureau of Standards and Underwriters Laboratories, Inc.

Write for name of distributor in your neighborhood.

Manufacturers of water cooling equipment since 1929.

TEMPRITE PRODUCTS CORP.

35 PIQUETTE AVE. DETROIT 2, MICH.

YOU WANT TO KNOW

more about the items on this page

Letters to the addresses given will bring you further information.

FACE SHIELD, plastic, to be worn with R-1000 and R-2000 respirators. Protects eyes and face against impact of flying particles. May be worn over prescription glasses. American Optical Co., Southbridge, Mass.

LECTURE SERVICE. Talk on importance of steel files as cutting tools. Includes slidefilm and discussion period. Covers proper selection, use, and care of files. Demonstration of special purpose files. Nicholson File Co., Providence 1, R. I.

APPRENTICESHIP CREDIT for previous experience. Booklet. Study of practices in 39 trade apprenticeship programs throughout U. S. Principles and procedures. Suggested forms. Bureau of Apprenticeship, U. S. Dept. of Labor, Washington 25, D. C.

HAND TOOL STAND holds Moto-Eraser. Contains well for storing eraser tips. Crackle-finish. The Dremel Mfg. Co., 1300 14th St., Racine.

POSITIONING DEVICE, pneumatic, can accurately position a lever within a few thousandths of an inch over range of 0 to 0.5 inch, states maker. No mechanical linkage. Hagan Corp., 300 Hagan Bldg., Pittsburgh.

BACTERIAL FLYPAPER for trapping airborne disease. Germseal is mixed with water; applied to floors and fabrics. L. S. Green Associates, 160 West 59th St., New York 19.

CUTOFF WHEEL, reinforced-type, Alundum. Norflex is available in 14-, 16-, and 20-in. diameters, and thicknesses of $\frac{5}{32}$ and $\frac{3}{16}$ inch. For non-ferrous metals. Norton Co., 50 New Bond St., Worcester 6, Mass.

CRIME LOSS PREVENTION. Booklet, 28 pages. Lists common kinds of crime losses with best prevention methods. Free. Continental Casualty Co., 310 South Michigan Ave., Chicago 4.

NEW PRODUCTS and services listed in 80-page booklet. Names and addresses of all manufacturers. Over 1000 products. Price, 50 cents. N. Y. Journal of Commerce, 63 Park Row, New York 15.

RAT CONTROL. "Rat Proofing Buildings and Premises," Conservation Bulletin 19. "Rat Control Methods," PA-41. Booklets containing principles and methods. Fish and Wildlife Service, U. S. Dept. of the Interior, Washington, D. C., 25.

ELECTRONIC GLUE DRIER. High-frequency dielectric heating unit cuts labor costs for gluing up to 70 per cent, states maker. Cures glue in few seconds. Applicator has pistol handle with trigger control. Industrial Electronics, Inc., Los Angeles.

THERMOPLASTIC. Versalite is said to be tough, light, easily formed, noncorrosive, stable. Has high electrical insulating properties, low rate of heat conductivity, high impact strength. Can be obtained in any thickness above

SAFETY SIGNS, phosphorescent. Visible in bright light (left) and in total darkness (right). Can be made of porcelain, baked enamel, plastic; hand painted, stenciled, or decalcomania transfers. Nulite Displays Co., 15 East 26th., New York

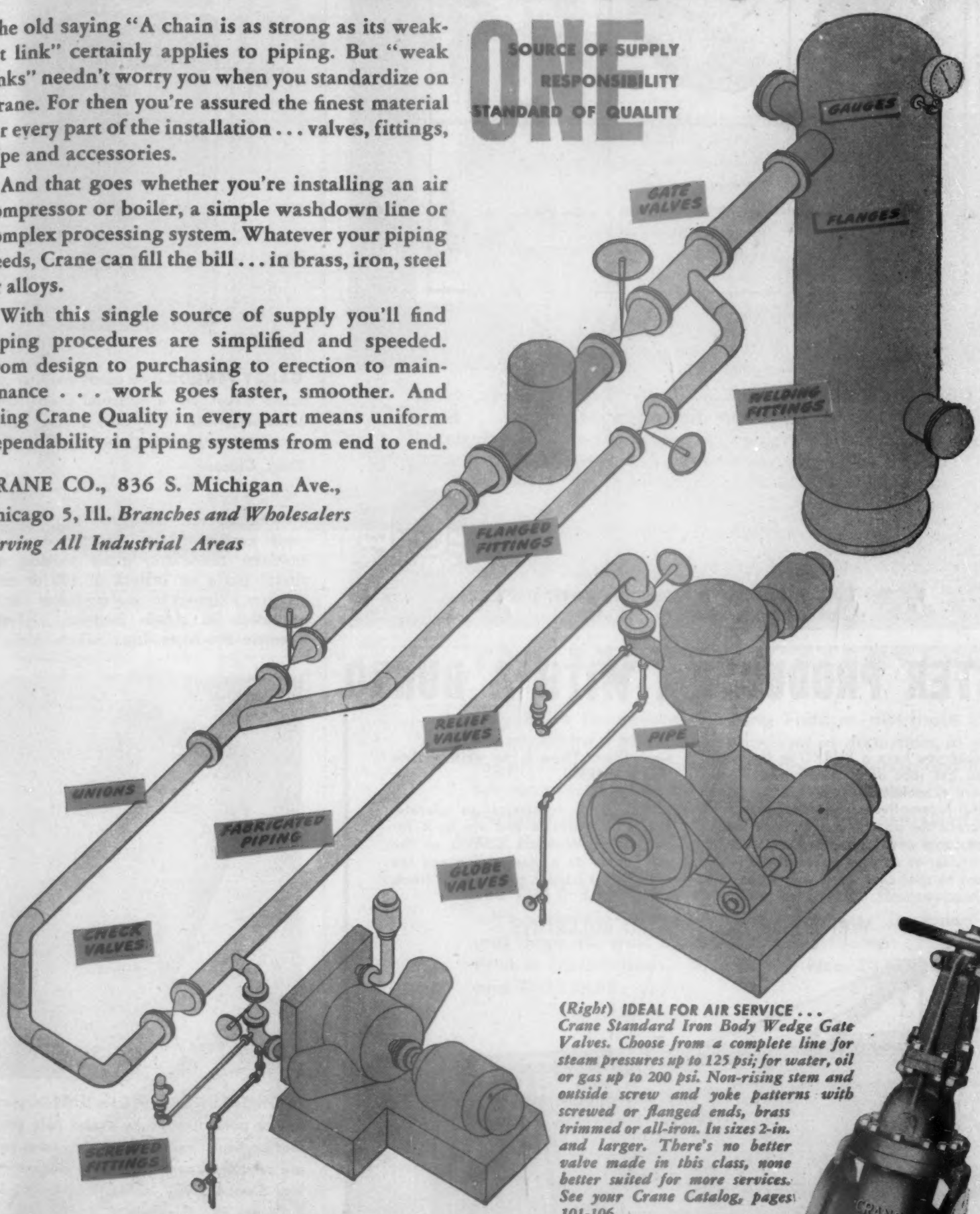
No worry about "weak links" when all piping is Crane

The old saying "A chain is as strong as its weakest link" certainly applies to piping. But "weak links" needn't worry you when you standardize on Crane. For then you're assured the finest material for every part of the installation . . . valves, fittings, pipe and accessories.

And that goes whether you're installing an air compressor or boiler, a simple washdown line or complex processing system. Whatever your piping needs, Crane can fill the bill . . . in brass, iron, steel or alloys.

With this single source of supply you'll find piping procedures are simplified and speeded. From design to purchasing to erection to maintenance . . . work goes faster, smoother. And using Crane Quality in every part means uniform dependability in piping systems from end to end.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill. *Branches and Wholesalers Serving All Industrial Areas*



(Right) **IDEAL FOR AIR SERVICE . . .** *Crane Standard Iron Body Wedge Gate Valves. Choose from a complete line for steam pressures up to 125 psi; for water, oil or gas up to 200 psi. Non-rising stem and outside screw and yoke patterns with screwed or flanged ends, brass trimmed or all-iron. In sizes 2-in. and larger. There's no better valve made in this class, none better suited for more services. See your Crane Catalog, pages 101-106.*

EVERYTHING FROM . . .

VALVES . FITTINGS
PIPE . PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM

REDUCE PRODUCTION COSTS—F.O.S. Tape is handy, versatile, inexpensive. Simplifies production in *many* ways . . . Stays put—but can be removed quickly without requiring "cleanup." Let SEAMLESS analysts show you how to save time and money with F.O.S. No obligation! . . . *Write today for samples and prices.*

FINEST QUALITY SINCE 1877

SEAMLESS REG. U. S. PAT. OFF.

INDUSTRIAL TAPE DIVISION
THE SEAMLESS RUBBER COMPANY
NEW HAVEN 3, CONN., U.S.A.

FASTER PRODUCTION WITH A BURRO

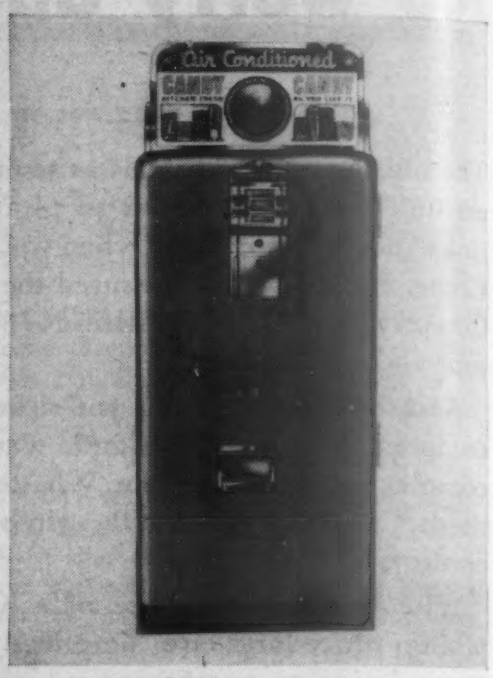
When you have a BURRO in the yard you get jobs done faster, easier and more economically. This speedy, powerful locomotive crane does every job a crane can do with bucket, hook, magnet, tongs or drag-line and at the same time, serves as your private switch engine to spot cars *where* and *when* you want them. There is no waiting time with a BURRO.

BURROS are economical to operate, simple to maintain and are built for hard work. Watch a BURRO on the railroad or on a plant siding and see why it's the busiest crane on the track.

WRITE FOR ILLUSTRATED BULLETINS

CULLEN-FRIESTEDT CO.
1321 S. Kilbourn Ave., Chicago 23, U.S.A.

0.020 inch. United States Rubber Co., Rockefeller Center, New York.



CANDY VENDOR is air conditioned for year-round dispensing in industrial plants. Offers seven selections. Illuminated display. Vermin-proof. U. S. Vending Corp., Board of Trade Bldg., Chicago 4

FLUORESCENT GUARANTEE for one year covers lamps, starters, ballasts, holders, reflectors, glass shields, and metal parts on orders of 100 or more fixtures shipped to one customer for installation in single location. Sylvania Electric Products, Inc., Salem, Mass.

RADIUS GUIDE is cut from 0.030-in. plastic. Radius point located by center hole serving that particular radius. Sizes and radius points are printed on negative side to prevent wearing. Size, 4¾x9¾ inches. Rapidesign, Inc., P. O. Box 592, Glendale, Calif.

CASTINGS, pressure-molded aluminum base alloy-type. Said to combine desirable features of die castings, forgings, heat-treated permanent molded castings. The Lukens Aluminum Corp., Dayton 1.

RECORD PLAYER. Holds 100 records. Individual selectivity. Plays either or both

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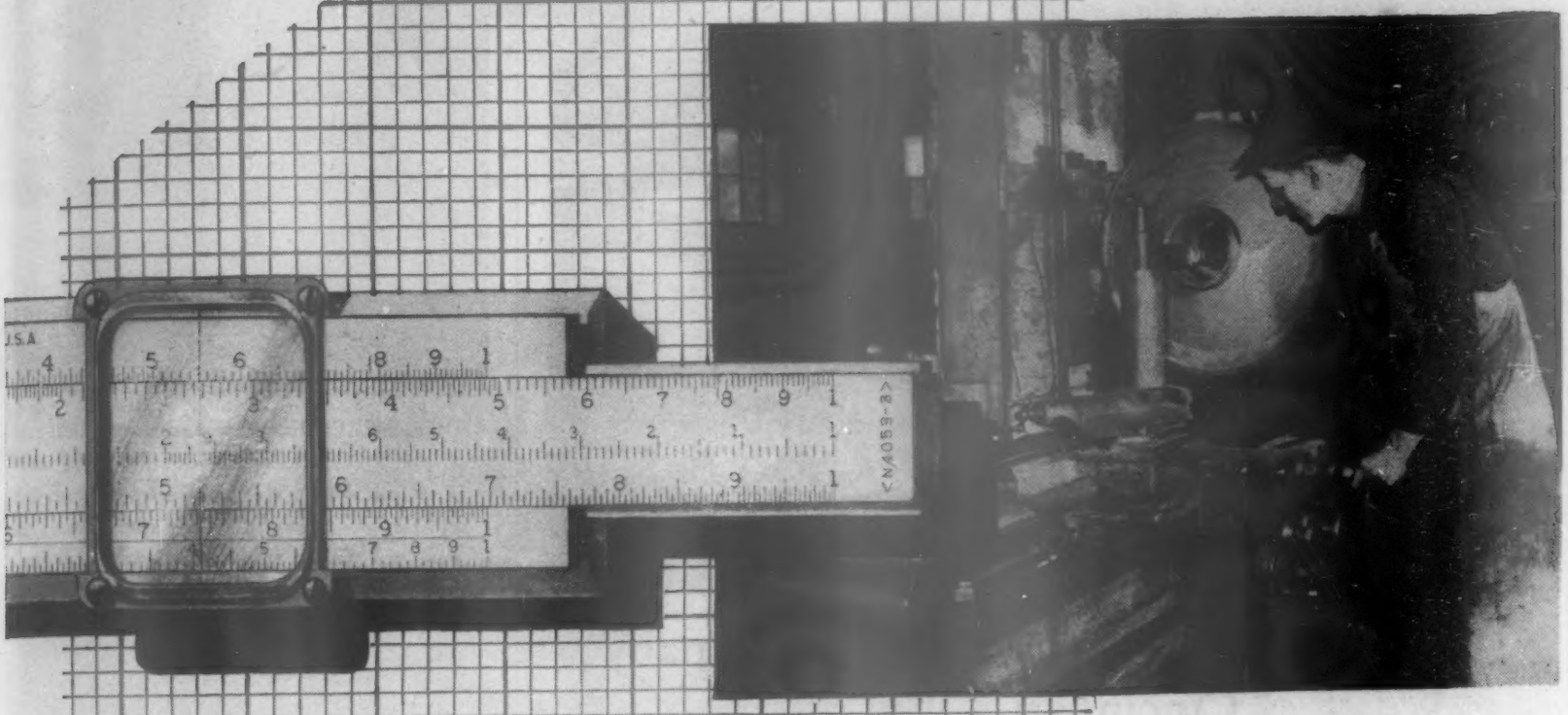

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Day-Brite Fluorescent Lighting Fixtures distribute the light evenly without glare, deep shadows or distortion, as required for precision work. They are rigidly constructed and designed for easy installation and carefree maintenance.

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The DAY-LINE heavy-duty industrial fluorescent fixture with porcelain-enameled steel reflectors. Designed for two and three 40-watt and two 100-watt lamps . . . unit or continuous installations. U. S. Patent Nos. 2317434, D-135375 and D-133458.

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Nationally distributed through leading electrical supply houses.

In Canada address all inquiries to Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

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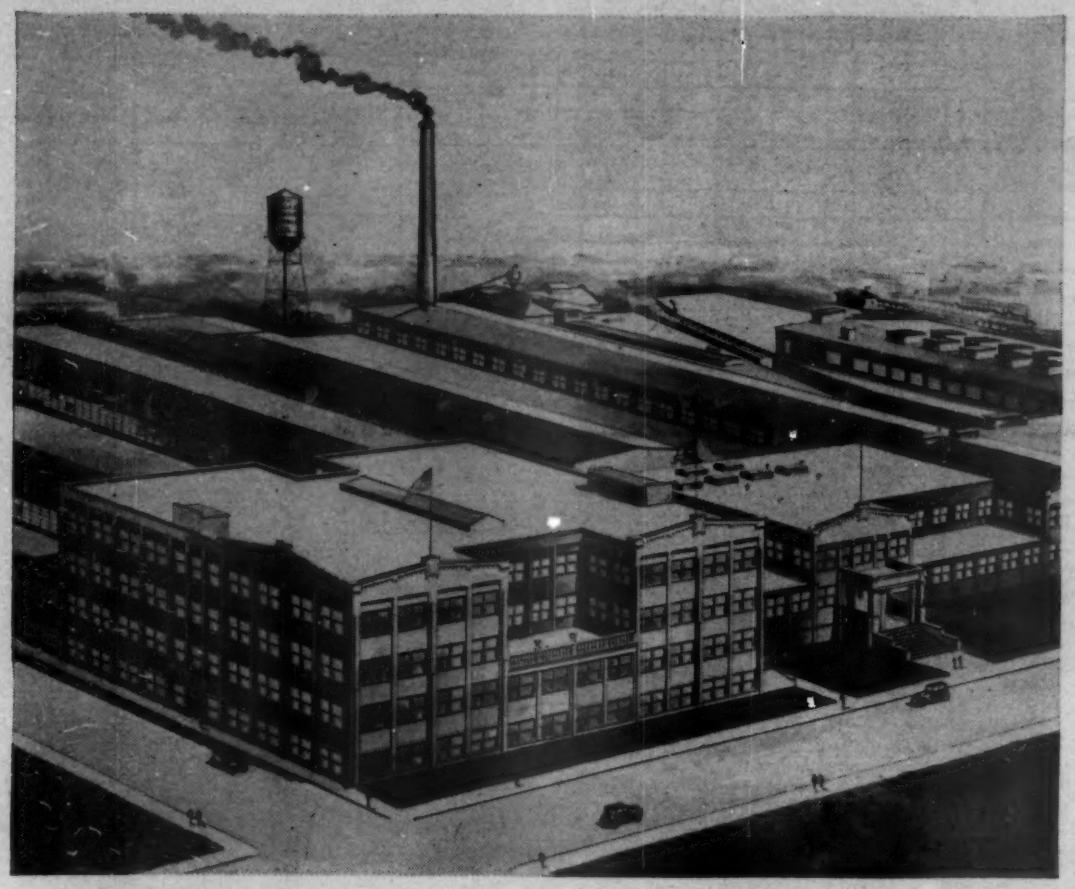
IT'S EASY TO SEE WHEN IT'S

DAY-BRITE *Lighting*

"KEX" Industrial Wiping TOWELS



American Laundry Machinery Company
Cincinnati, Ohio

Uses "KEX" Service

THE list of subscribers to "KEX" National Service reads like a volume of America's Industrial "Who's Who."

The low cost and efficiency offered by "KEX" Industrial Wiping Towels are behind this definite trend to "KEX" National Service. Managements like the idea of this automatic rental service that follows their wiping towel needs from week to week. The neat, easily handled bundles in which "KEX" are delivered help control distribution, and contribute to better housekeeping.

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sides of any record without turning record over. Can be used with speaker and sound systems. Plays on predetermined time cycle, automatically. J. P. Seeburg Corp., 1510 North Dayton, Chicago.

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FILMS

Material on the Move, 16 mm., sound, color. Highlights application of Caterpillar scrapers over a full range of earth-moving operations. Overhead and worm's-eye views. Stripping, cutting, leveling operations. Caterpillar Tractor Co., Peoria 8.

The World's Fastest Steel Rolling Mill describes new five-stand tandem mill at Aliquippa Works. Sound; 5 minutes. Jones & Laughlin Steel Corp., 311 Ross St., Pittsburgh 30.

Barber-Greenes in Action, 16 mm., color, sound, 26 minutes. Pictorial presentation of materials handling machines. Barber-Greene Co., 630 West Park Ave., Aurora, Ill.

Designing Machinery for Arc Welding, 16 mm., sound, color. Compares various materials. Explains freedom of welded design. Animated; running time, 15 minutes. Lincoln Electric Co., Dept. 591, Cleveland 1.

Straightline Unscrambling Table. Two rolls, 600 feet, black and white, silent, 23 minutes. Construction details, adjustments for various containers. Applications. Island Equipment Corp., 101 Park Ave., New York 17.

Curiosity Shop. Story of research and development of aluminum. Technicolor, sound, 30 minutes, 16 and 35 mm. Features June Lockhart, John Litel. Available July 1. Motion Picture Dept., Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh 19.

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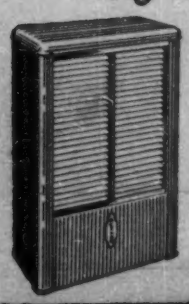

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SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Lecturer on Government Regulations, New York University, and a Member of the New York Bar

Period Surveyed: April 1 to May 1

TREND INDICATORS
Wage Hour

ARBITRATOR DOES NOT HAVE AUTHORITY TO SET PIECE RATES

Where the contract specifically states that "the determination of piece rates is a function of management," an arbitrator does not have the authority to set a piece rate for a new operation which was assigned to employees. Under the contract, the arbitrator's jurisdiction over piece rates is limited to those matters that imply that rates have been improperly changed. (In re arbitration between Armour & Company and United Packinghouse Workers of America)

CONTRACTOR GUILTY OF EMPLOYING MINORS

An employer was guilty of having "knowingly employed" three minors, where he failed to check their age statements and relied on the age statements of minors themselves and minors' parents and relatives. The administrator held that a contractor is required to check the age statements of minor applicants "where the applicants appear sufficiently youthful to put him on notice that an independent inquiry is indicated." (Drycemble Corp., Decision of Administrator under Public Contracts Act)

EMPLOYEES ENGAGED IN PRODUCTION OF GOODS FOR COMMERCE

Employees of a mutual irrigation company, who performed physical work in connection with the irrigation of land on which agricultural commodities were produced for processing into finished products, were held to be engaged in the production of goods for commerce. In determining whether an employee is covered by the Act, it is not necessary that the employee come in actual physical contact with the goods produced. He meets the requirements of the Act if his work has such "close and immediate tie with the process of production for commerce that it is in effect a part of i." (McComb v. Farmers Reservoir & Irrigation Company, CCA-10)

HELD EXEMPT

A chief clerk was held to be an executive employee, where he supervised the work of each employee, exercised the authority of transferring his subordinates from one job to another, checked the work of employees, made recommendations concerning the employment of new personnel, and trained new workers. Although the chief clerk did help in rush, he never performed more than 20 per cent of the type of work done by non-exempt employees. (McGuire v. Hercules Powder Company, USDC E. Tenn.)

STATUTE OF LIMITATIONS DOES NOT APPLY TO GOVERNMENT

The statute of limitations provision as contained in the Portal-to-Portal Act, which limits to two years the time within which actions may be brought under the Public Contracts Act and other wage-hour laws, does not apply to administrative proceedings brought by the United States. A statute of limitations never applies to the government unless the government is specifically mentioned in the statute. (Standard Ice Company, Decision of Hearing Examiner Under Public Contracts Act)

LABOR MANAGEMENT RELATIONS

***EMPLOYER'S PRE-ELECTION ACTIVITIES INVALIDATED ELECTION**

While an employer's pre-election activities did not constitute interference because they contained no threat of reprisal or promise of benefit, the board found that the pre-election letters, pamphlets, and speech prevented a free choice in an election. Said the board, "Certain circumstances may afford unquestionable justification for setting aside an election as not reflecting the free choice of representatives contemplated by the Act, notwithstanding the fact that they do not constitute unfair labor practices." (General Shoe Corporation and Boot & Shoe Workers Union, NLRB)

***DID NOT CONSTITUTE FREE SPEECH**

An employer's anti-union statements did not constitute free speech, where the board found that the employer pursued a course of conduct designed to restrain and coerce his employees in the exercise of rights guaranteed them by the Act. Such anti-union conduct is not protected under Section 8(c) of the Labor Management Relations Act. (NLRB v. Gate City Cotton Mills, CCA-5)

***DISCHARGE NOT JUSTIFIED**

Where the contract permits the employer to discharge for just cause and provides for the submission of disputes to arbitration, an employer may not discharge an employee for violating a rule he unilaterally established, which provides for

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* In this classification, items marked with an asterisk also are considered to be trend indicators.

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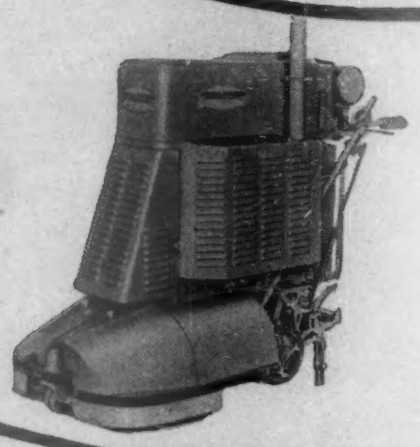

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Write for Industrial Maintenance Bulletin

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LABOR DEVELOPMENTS *(continued)*

suspension and discharge of employees who accumulated a specified number of absences. Although management has the right to make plant rules, which are not dependent on union approval, the rules are subject to the union's objections that they are inconsistent with or in violation of the contract. Any dispute over these rules must be resolved through bargaining techniques or by the grievance procedure. The arbitrator held that the placing of the seal of approval on the absentee rule would have the effect of changing the basis of suspension or discharge from "just cause" to "violation of the rule." (In re arbitration between John Morrell & Company and United Packinghouse Workers of America)

***DISCHARGE JUSTIFIED**

An employer has the right to discipline employees for the violation of plant rules and regulations which occur outside of the plant proper, where such violations are directly related to incidents that arose in the plant. The arbitrator found that discharge was a justifiable penalty for an employee who engaged in altercation with another employee in front of the plant, since the incident was the culmination of a dispute which began between the employees earlier in the morning in their department. (In re arbitration between National Lock Company and United Automobile, Aircraft & Agricultural Implement Workers of America)

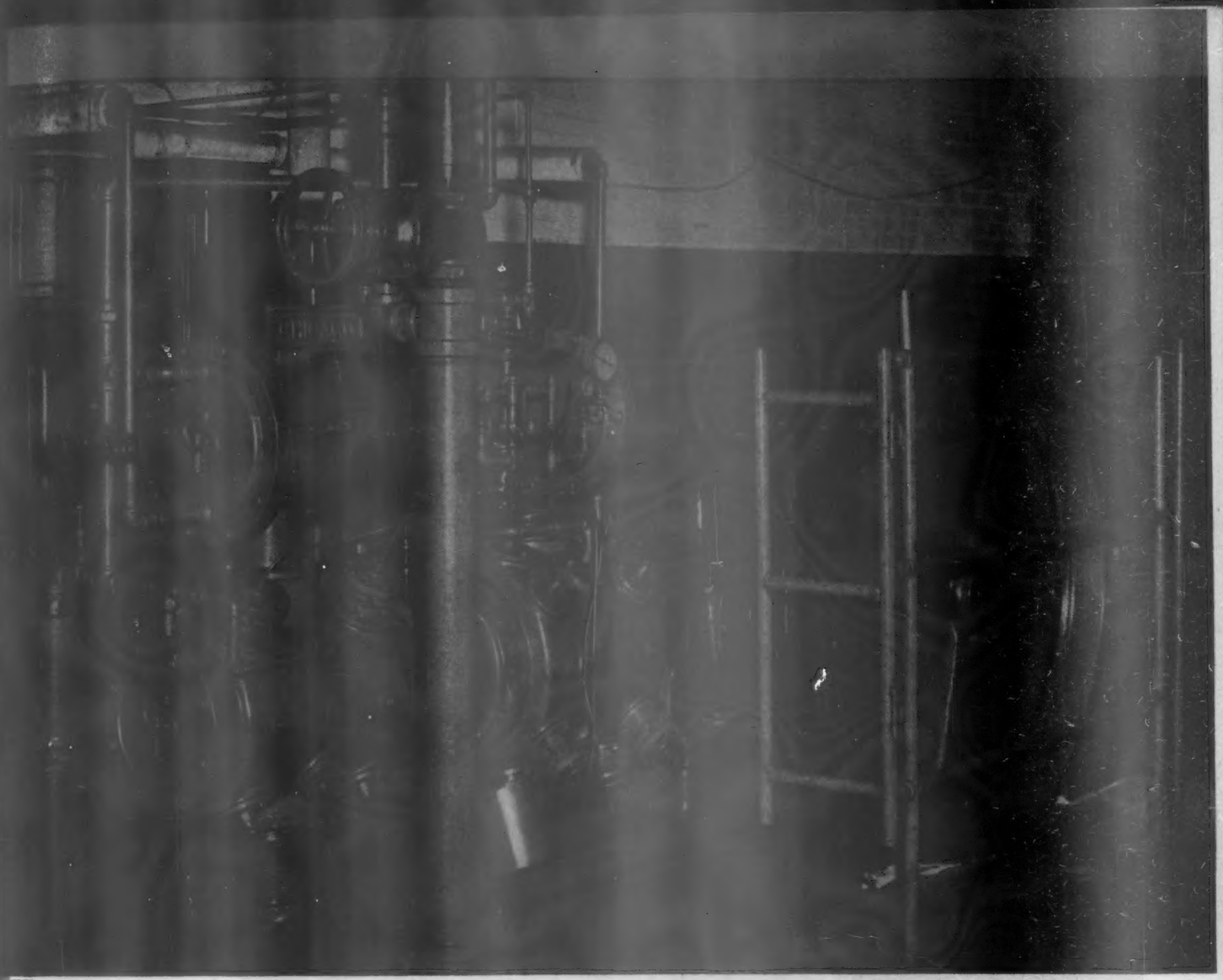
***EMPLOYER NOT GUILTY OF REFUSAL TO BARGAIN**

Where an employer refused to supply the union with a point evaluation system on which job classifications were based, he was not guilty of a refusal to bargain. The company contended that its obligation to bargain with the union does not mean that the company must open its books or confidential records for union examination. The arbitrator held that the fact that a company has developed such a point evaluation system, and that it is relying upon that information in advancing its proposals or in resisting those of the union, cannot in itself be regarded as a refusal to bargain.

While the company has attempted to gain the union's acquiescence in its unilateral system of point evaluation, such action is not *prima facie* evidence of refusal to bargain. The union can develop its own method of comparison and use this method as a basis for accepting or rejecting the company's proposal. "The parties are entitled to develop information independently and for the purpose of pressing their respective positions. Such private information is not controlling, nor can it be regarded as determinative in the event of disagreement." (In re arbitration between Borg-Warner Corporation and United Farm Equipment & Metal Workers of America)

***EMPLOYER REQUIRED TO DISCUSS PENSION PLANS AND INSURANCE BENEFITS**

An employer is required to bargain on the subjects of pension plans and in-



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A midwest pump manufacturer was having carbon-deposit trouble with the valves of the compressor shown above. Frequent cleaning was compulsory. Maintenance cost was high, compressor efficiency low.

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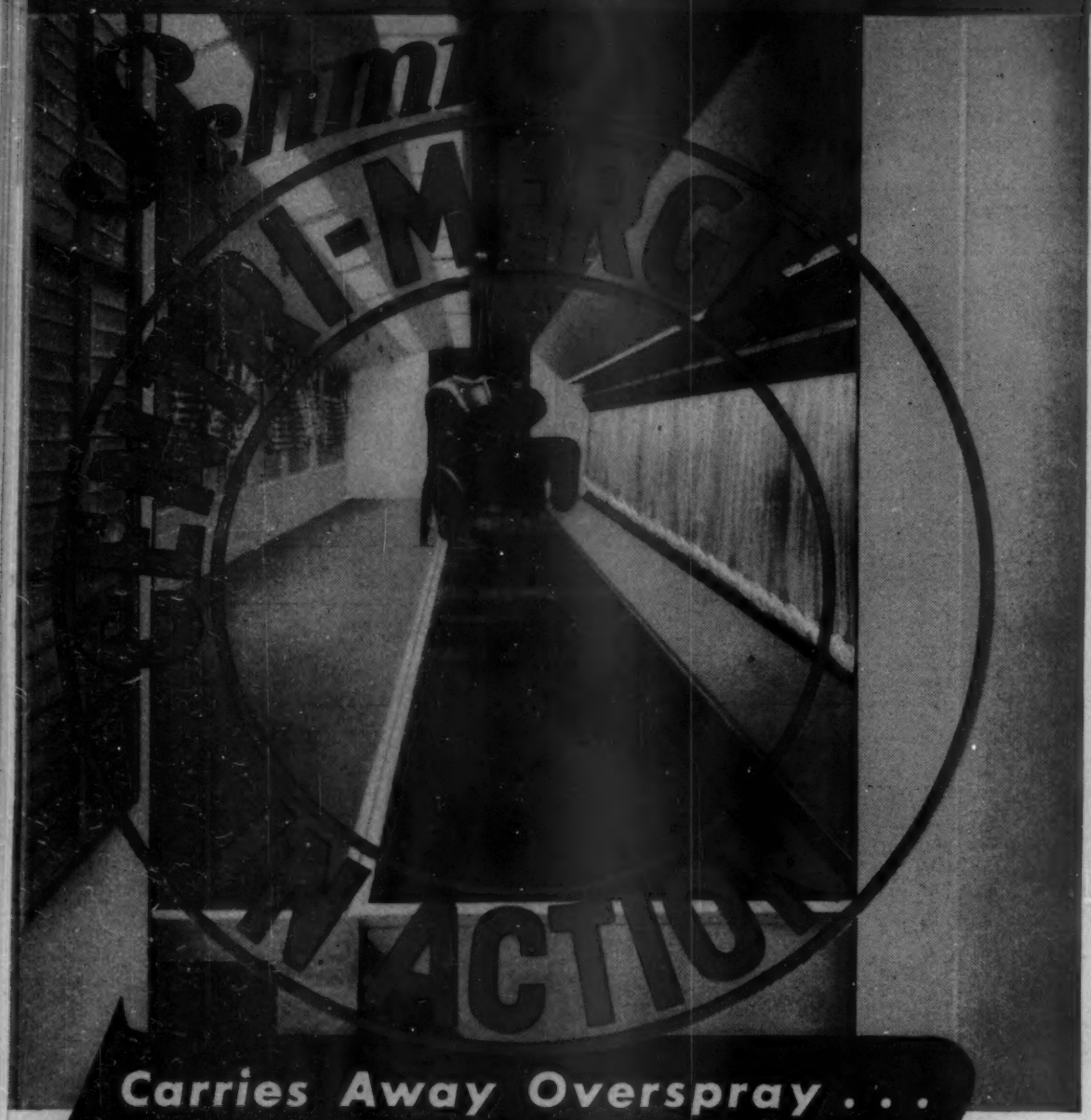

Exterior view of above installation

Compact unit for smaller spraying jobs

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Consult Schmieg engineers regarding your problems of dust and fume control.

THE *best* AIR PURGE is CENTRI-MERGE

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surance benefits, since such topics are within the mandatory area of collective bargaining under the original and the amended Act. The term "wages" as contained in Section 9(a) of the Act includes emoluments of value, like pension plans and insurance benefits, which may accrue to employees out of their employment relationship. The employer's monetary contribution to the pension plan constitutes an economic enhancement of the employee's money wages. The retirement plan, which compelled the severance of the employment relationship at the age of 65, affected the tenure of employment and, therefore, constituted a "condition of employment" as to which collective bargaining is obligatory under the Act. "The historical pattern of collective bargaining with respect to social insurance plans, whatever it be, affords no reasonable basis for supplying a Congressional intent to exclude such plans from the ambit of obligatory bargaining." (Inland Steel Company and United Steelworkers of America, NLRB)

***GENERAL WAGE INCREASE NOT ARBITRABLE**

Under a contract which provided that "the contract may be opened to consider general wage increases," the employer was not required to submit the issue to arbitration, where the parties failed to agree on a wage increase. The employer met his contractual obligation when he held meetings with the union and considered wage increases. (In re Vasek, NYSC. Special Term, Part 1, New York County)

***ARBITRATOR HAS AUTHORITY TO AWARD MONEY DAMAGES AGAINST COMPANY**

Under a contract which stated, "When an employee is assigned to a new and different job, he will be informed in advance of the piecework price . . .," an employer was guilty of breaching of the contract where he gave new piecework assignments to four employees, but did not inform them of the piecework price on the various jobs involved until after they had worked on them for some time.

The company cannot contend that the clause establishes only a "good faith" guide to company action and creates no real contractual obligation. Even though the contract clause provided no penalties in the case of a violation, the arbitrator had the right to award money damages to the injured employees, since the company, in the past, made voluntary payments to employees injured by the employer's breach of contract. "To restrict arbitrators to remedies specifically set fort in contracts would negate arbitration as a method of dispute settlement." (In re arbitration between International Harvester Company and United Farm Equipment & Metal Workers of America)

***AUTOMATIC RENEWAL NO BAR TO DECERTIFICATION**

Despite the fact that the contract contained an automatic renewal clause, a decertification election may still be held, although the contract was reopened by

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the union advising the employer that it desired certain changes in the contract, the union took no further action; it never forwarded the proposed changes, and no negotiations were ever held looking to a new contract. (Whiten Machine Works and International Molders & Foundry Workers Union of North America, NLRB)

***UNION-SHOP ELECTION ALLOWED AFTER A REPRESENTATION ELECTION**

Under the Labor-Management Relations Act of 1947, a union-shop election may be held within a year after a representation election. Section 9(e) which reads, "No election shall be directed in any bargaining unit or subdivision within which, in the preceding 12-month period, a valid election shall have been held," was not intended to preclude a union-shop election at any time after a representation election. (Gilchrist Timber Company and Lumber & Sawmill Workers Union, NLRB)

***INDIVIDUAL MAY NOT INTERVENE IF UNION FAILS TO FILE NON-COMMUNIST AFFIDAVITS**

Where an individual, who was an agent of a union which failed to file the non-communist affidavits, sought to intervene in a representation election, the board denied her a place on the ballot. It was the union's idea that, since it would not comply with the filing requirements of the Act, it would circumvent the law by having an individual intervene instead. (Campbell Soup Company and Cannery Workers & Warehousemen's Union, International Brotherhood of Teamsters, Chauffeurs & Warehousemen & Helpers of America, NLRB)

***BOARD WILL NOT INQUIRE INTO UNION'S CONSTITUTION**

Unless positive proof can be shown that the union will not accord effective representation to the employees, the board will not inquire into a union's constitution in a representation proceeding. (Baldwin Locomotive Works and International Brotherhood of Electrical Workers, NLRB)

***PREFERENTIAL SENIORITY FOR UNION STEWARDS APPLIES ONLY TO LAYOFF**

Under a contract which provides that union stewards shall have top seniority for the purpose of layoffs only, an employer may demote a union steward ahead of employees with greater length of service when a reduction in the number of employees in the steward's classification becomes necessary. The arbitrator rejected the union's contention that the company actually transferred the employee to a lower classification in lieu of a layoff and that, therefore, the transfer was equivalent to a layoff. The arbitrator pointed out that only by implication does seniority cover demotions in case of a cutback in production. "Top seniority for the purpose of layoffs only provides ample protection for the steward and the union whose representative he is. To make this pro-

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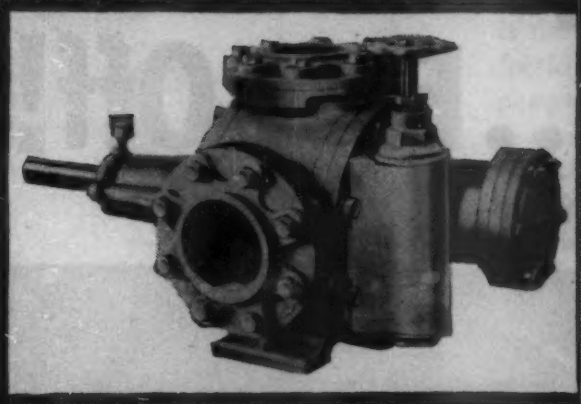

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☐ Corn Syrup	☐ Ink	☐ Paint	☐ Varnish
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NAME.....

COMPANY.....

CITY..... Zone ..... State

vision apply to the particular job classification goes beyond the principle and purpose of top seniority and threatens seriously to impede the task of management in its right to assign the work force in the interest of effective production." (In re arbitration between The Thor Corporation and United Electrical, Radio & Machine Workers of America)

***COMPANY NOT REQUIRED TO CONTINUE PAST PRACTICE**

Although the company for the past 10 years has permitted the distribution of union literature during non-working time, the company is not required to continue such practice, since it was never made part of any local agreement. The arbitrator could find no evidence that any agreement was ever entered into. While a company official did state at one meeting that he would not object to the distribution of literature on company premises so long as it was not done during working hours, this mere statement was not sufficient to establish an agreement arrived at through collective bargaining. (In re arbitration between Armour & Company and United Packinghouse Workers of America)

***PAST CUSTOMS CONSIDERED PART OF THE CONTRACT**

Where an employer in the past has considered seniority in making assignments, he must continue to observe such custom, despite the fact that he never entered into a formal oral agreement to grant such preference, "since customs long acknowledged and adhered to have much the same force as agreements." The arbitrator found that the company's admission of the custom made it unnecessary to find a formal verbal agreement. (In re arbitration between United States Rubber Company and United Textile Workers of America)

***LAID-OFF EMPLOYEE MAY REFUSE A TEMPORARY TRANSFER**

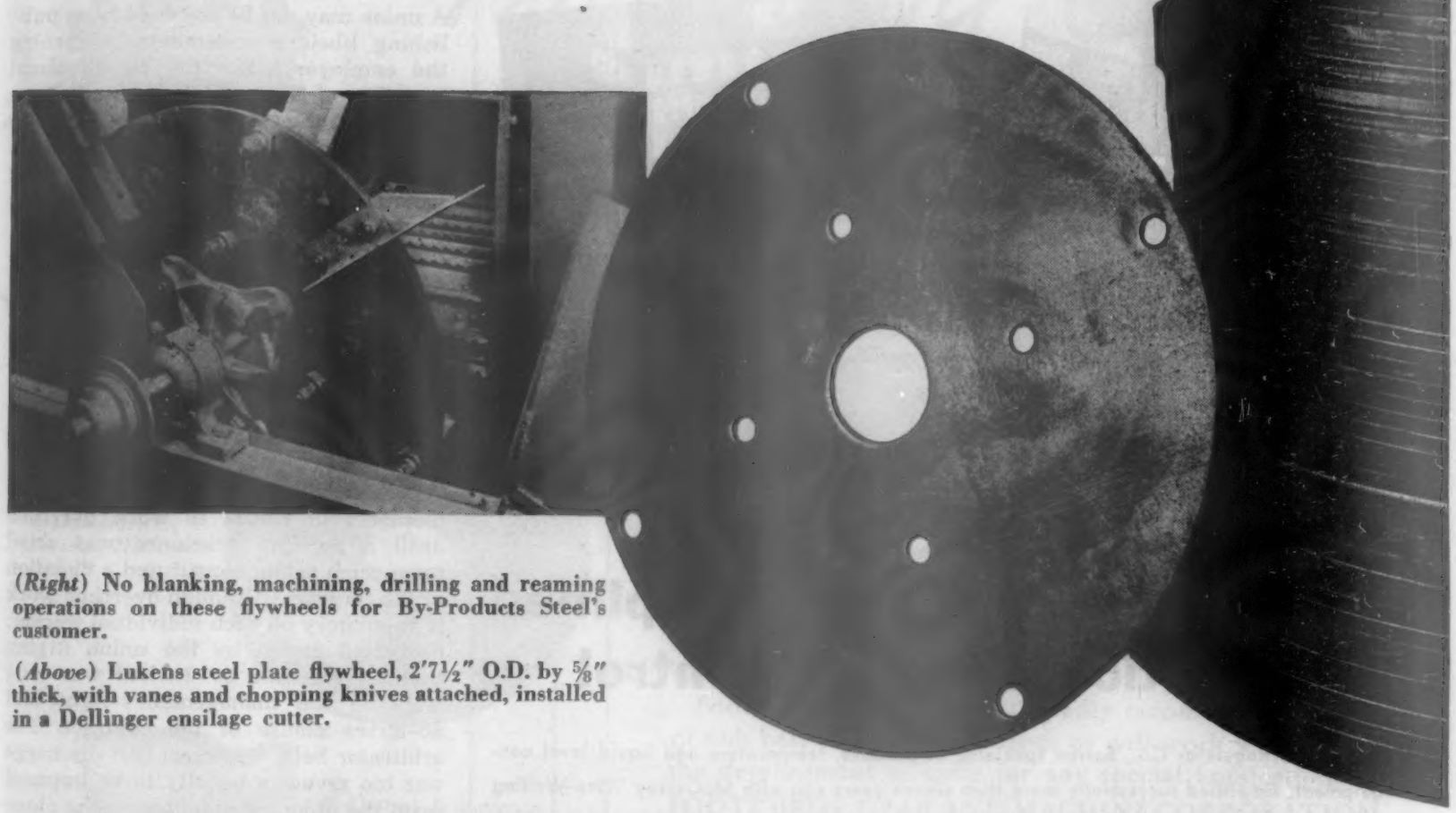
A laid-off employee who refused to accept a job different from his former position may not be deemed to have resigned from the company, since the contract does not specify that refusal to accept a temporary transfer constitutes a voluntary quit. In the instant case, the employee accepted recall to a different job, but left a few days later, explaining that the work was too heavy for him. The union contended that employees who accept temporary work and who later, for some reason, reject such work are not quits within the meaning of the term "resign" as contained in the agreement. (In re arbitration between Wilson & Company Inc., and United Packinghouse Workers of America)

***FEDERAL DISTRICT COURT MAY NOT ENJOIN EMPLOYER TO BARGAIN**

Under the Labor-Management Relations Act, a federal district court may not issue an injunction, upon the union's request, requiring the employer to bargain with the union. The court held

These steel plate shapes

PUT PRODUCTION 9 STEPS AHEAD



(*Right*) No blanking, machining, drilling and reaming operations on these flywheels for By-Products Steel's customer.

(*Above*) Lukens steel plate flywheel, 2′7½″ O.D. by ⅝″ thick, with vanes and chopping knives attached, installed in a Dellinger ensilage cutter.

These flywheels are flame-cut, gang punched and flattened when shipped by By-Products Steel Co. Thus, Dellinger Manufacturing Company of Lancaster, Pa., avoids the nine operations formerly required in their plant to get these parts to the same degree of completion. Labor, machines and floor space are released for other work.

The scrap trimmed from these circles goes right back to Lukens open hearths to speed the making of more steel. Scrap allowance is made at the mill where its value is highest. The customer has no freight or handling charges on that scrap. He saves time and money.

Made from Lukens Steel Plate, these flywheels are uniformly high in strength, dependable and safe.

Prompt delivery is another advantage of buying your steel plate already shaped by By-Products Steel Co. We have more than 150 major machines for production of parts to be flame-cut, sheared, pressed, bent, blanked or shaped in any manner, using carbon, alloy and clad steels.

Bulletin 270 pictures typical products made by By-Products Steel Co., Division of Lukens Steel Company, 421 Strode Avenue, Coatesville, Pennsylvania.

LUKENS
BY-PRODUCTS STEEL DIVISION

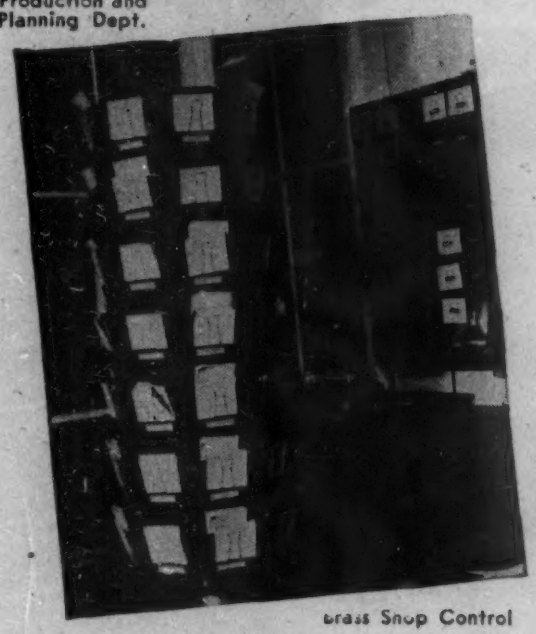
BY-PRODUCTS STEEL CO.

STEEL PLATE SHAPES

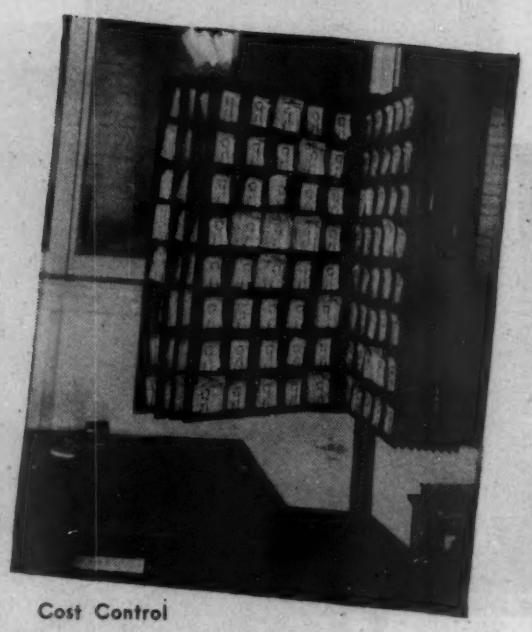
FLAME-CUT ★ SHEARED ★ PRESSED ★ BENT ★ BLANKED ★ WELDED

• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •

Production and Planning Dept.



Brass Shop Control



Cost Control

HOW MASON-NEILAN simplified Production and Cost Control

Mason-Neilan Regulator Co., Boston specialist in pressure, temperature and liquid level control equipment, simplified successfully more than eleven years ago with McCaskey "One-Writing and Visible Filing" systems. Their objective was to "hold down costs without sacrificing high quality standards."

Their controls include: the machine load for all machines at all times; the delivery of material to machines; the progress of each production order and the number of pieces produced daily compared with standards and schedules; the daily cost status of a thousand jobs in process; detailed costs almost immediately after their completion.

Three-copy time tickets made at "one-writing" provide identical data from the shop to three control divisions where they are immediately visualized on McCaskey Planning Boards for quick reference by planning and cost clerks. Their systems are stream-lined for speedy, effective action.

Write for a demonstration and suggestions for an application to your particular needs —or send for a copy of "The ABC's of Production Control" and other descriptive folders.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

that an examination of the National Labor Relations Act indicates that the only rights made enforceable by the Act were those determined by the board to exist under the facts of each case and that "the federal trial courts were without jurisdiction to redress by injunction or otherwise the unfair labor practises which it defined." The amended Act does not change the method by which unfair labor practices were dealt with under the Act, nor does it vest the district courts with jurisdiction as to these matters, except to the limited extent that such jurisdiction was expressly conferred. (Amazon Cotton Mill v. Textile Workers, CCA 4)

*UNION MAY NOT BE ENJOINED

A union may not be enjoined from publishing libelous statements concerning the employer, since the constitutional guaranty of free speech generally prohibits both the courts and the legislature from putting restraints on publications. "In the absence of the showing of a violation of some property right, or some breach of trust or of a contract, an injunction is not available to prevent actual or threatened publications of a defamatory character." (Montgomery Ward & Company Inc., v. United Retail, Wholesale & Department Store Employees of America, Ill. Sup. Ct.)

*CONCERTED REFUSAL OF OVERTIME HELD VIOLATION OF CONTRACT

Where a union president ordered the members to refuse to work overtime until a pending grievance was acted upon, such action constituted a violation of the contract. Although overtime work is mandatory on each individual worker, concerted action by the union urging that no overtime be worked was contrary to the management's-right and no-strike clause of the contract. The arbitrator held, however, that discharge was too severe a penalty to be imposed upon the union president, since he alone was not responsible for the action, having acted pursuant to the decision of a meeting of stewards and having been accompanied by two other union officials. The employee was therefore ordered to be reinstated without back pay. (In re arbitration between Brewer Dry Dock Company and Brewer Dry Dock Employees Association, Inc.)

*BOARD WILL ORDER DISESTABLISHMENT OF COMPANY-DOMINATED UNION

In all cases in which an employer is found to have dominated a labor organization in violation of Section 8(a)(2) of the Labor-Management Relations Act, disestablishment of such organization will be ordered regardless of whether the organization is affiliated. This proviso ends prior NLRB policy of not ordering employer-dominated labor organizations disestablished if they were affiliated with a national or international federation. The difference in the treatment accorded affiliated and non-affiliated organizations was based upon the

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▲ Elevon Control on Northrop Flying Wing

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Performance of high-quality gears is affected in no small measure by the accuracy of their assembly and the precision of their mounting in their housing. Many manufacturers, recognizing this, look to Foote Bros. for complete units ready to install in the equipment they manufacture.

The wide experience of Foote Bros. in the production of equipment to transmit power, to reduce or increase speed, or to provide control, may be of assistance to you.

Foote Bros. Actuators and Power Units may be designed to meet virtually any practical limitation in space or weight. The "A-Q" (aircraft quality) Gears used in their construction permit operation at extremely high speeds, assure low noise level and provide unusually high efficiency.

Speed Reducers for general commercial applications are available in both helical and worm gear types in a wide variety of sizes and ratios.

Foote Bros. engineers will gladly recommend the type of unit best suited to your needs or will work with you on the development of units for any special application.

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may be a major control factor in your search for greater production — reduced costs. Milford Rivet's *superior* fastenings are made of the finest materials available—precisely finished — minutely checked against rigid specifications.

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Tubular, Split and Compression rivets — Cold Headed Specialties — Rivet caps, Bottom Studs

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board's belief that "a labor organization affiliated with a national or international federation that was outside the orbit of the employer's control could not be permanently and completely subjugated to the will of the employer." However, when the National Labor Relations Act was amended, "Congress qualified the board's authority to direct affirmative action by adding a proviso which required that, in deciding cases involving unfair labor practices under Section 8(a)(1) or 8(a)(2), the board should apply the same regulations and rules of decision irrespective of whether or not the labor organization affected is affiliated with a labor organization, national or international in scope." (In re Carpenter Steel Company and United Steelworkers of America-CIO, NLRB)

EMPLOYER JUSTIFIED IN DOCKING EMPLOYEES

An employer was justified in docking his employees for time they spent in presenting grievances, since they did so without securing the required permission and congregated in large numbers in the office of the company representative. The arbitrator felt that the union's mass presentation of grievances was pre-arranged and perfectly deliberate as an attempt to embarrass the company. (In re arbitration between Swift & Company and United Packinghouse Workers of America-CIO)

ADMINISTRATOR ENTITLED TO INJUNCTION

Where an employer violated the record-keeping regulations required under the Fair Labor Standards Act, and refused to rectify its mistakes and correct its practices, the Administrator is entitled to an injunction against such employer. (McComb v. Lippold, USDC Neb.)

***PRIOR DECISION IS BINDING ON SUBSEQUENT ARBITRATION PROCEEDING**

Where a prior decision involves the interpretation of the identical contract provision, between the same company and union, such a decision is binding on subsequent arbitration proceedings. However, a prior arbitration award will not be binding when another company and union are involved, but will merely be persuasive. Similarly, where the prior decision involved the same company and union, but was principally a decision on facts rather than on the interpretation of a contract clause, it is entitled to no weight whatever under a different set of facts. (In re arbitration between Pan American Refining Corporation and Oil Workers International Union-CIO)

VACATION PAY OF SALES PERSONNEL SHOULD INCLUDE COMMISSION

An arbitrator ruled that the vacation pay of sales personnel should be computed on the basis of their total earnings, including commissions, instead of just base pay, where such a liberalized method is in line with the prevailing practice in the area. (In re arbitration between Namm, Inc., and Retail, Wholesale & Department Store Union-CIO)

IMMEDIATE DELIVERY

Model AR

You can depend upon Redington to make immediate delivery of these sturdy, 100% accurate Counters—"Watchdogs of Production." In models to fit punch presses, pumps, screw machines, packaging machines . . . conveyor lines, can making and box making machinery . . . in fact, all types of machinery and production lines. Easy to install. Write for Catalog.

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DOLGE laboratory-developed weeding preparations dispose of your weed problem scientifically and save many hours of costly manual weeding. DOLGE SS WEED-KILLER is applied where *no vegetation whatever* is wanted; E.W.T. *SELECTIVE* WEED-KILLER does not injure most grasses but destroys many types of obnoxious weeds.

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Write for DOLGE'S brand-new booklet "CHEMICAL WEED CONTROL"
It's complete and up-to-date; contains all the "facts" about quick, economical and "lasting" weed elimination.

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WRIGHT "OVERHEAD

means lower material handling

OVERHEAD

It's the new WRIGHT *Speedway* Electric Hoist. Sturdy, fast, dependable, easy-operating, long-lasting. When you get a *Speedway* you have a hoist with many extra use-advantages. Here are just a few of them:

- **Cable drum grooved to prevent damage to cable due to "piling"**
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... and many other features. From 250 to 2000 pounds capacities.

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THEY SAY AND DO

INSPECTOR'S COURSE OFFERED TO INDUSTRY

A free statistical methods training course for inspection personnel is being offered to major component-buying industries by Hunter Pressed Steel Company, Lansdale, Pa.

The weekly series of two-day courses is being offered as Hunter's contribution to the control of manufactured-parts quality.

The course, given in Lansdale, will be held on Tuesday and Wednesday of each week and will include seven lectures by top specialists in the field, one forum-type discussion, a complete plant tour, and a full afternoon of actual testing and calculating practice. The only expense to participants will be for living and traveling costs.

Methods and interpretations taught will have application throughout the length and breadth of the manufacturing world.

Management men who are involved in purchasing or inspection functions are invited to correspond with Hunter for particulars.

CLEVELAND GROUPS MAKE PERSONNEL SURVEY

A successful survey of personnel policies and practices in the Cleveland area suggests techniques available to any group of industries or any other industrial community that may wish to make a similar study.

In the fall of 1944, industrial personnel managers, members of the Industrial Relations Association of Cleveland and the Cleveland Personnel Association, working through the Cleveland Chamber of Commerce, with which they are affiliated, undertook for the first time to compile information on such personnel practices as vacations, sick leaves, holidays, insurance benefits, and numerous others.

A joint seven-man committee was appointed to select subject matter, establish rules of the game, and determine the timing of the study.

Basic purpose of the undertaking was to provide a measure of community personnel policies and practices against which an individual company might weigh its actions and decisions. A company's competitive position in attracting new employees, for example, is influenced by such benefits as pension plans, paid vacations, and forms of extra compensation. Discipline standards and work rules have their effects upon employee morale and profitable operation. There are a number of other subjects that are measuring sticks in the area of labor relations. The values in exchanging information of this type are apparent.

The basic reason for coordinating such a survey was threefold:

1. To avoid duplication of effort by individual companies.

2. To provide some uniformity in the type of information collected.

3. To put the collection of this information on a systematic basis.

Companies report valuable staff time in spot telephone questioning of other companies is saved by the survey; and that information is available when needed. The Cleveland Chamber of Commerce provided the necessary staff assistance (including confidential compilation of information gathered through a questionnaire prepared by the committee), and by handling mechanical details of duplication and distribution.

Subject Matter

Survey reports are designed solely to present facts, and are not intended as recommendations. To determine what subjects should be included, the group developed a list based on questions submitted by committee members and other members of the two associations, and questions which had been received and recorded in the past by the Chamber of Commerce. Each succeeding questionnaire has been made more compact by elimination of or change in questions which did not produce sufficiently useful information. After gaining experience in the gathering of information pertaining to wage earners, in February, 1946, a similar survey covering office employees was undertaken and found to be equally valuable.

Timing

It was first believed that the surveys should be undertaken on a predetermined timetable basis. The original schedule called for issuance twice a year. It has been found, however, that information is not required so frequently. Instead, it is now gathered and a report is compiled when the committee feels it will be most useful to the participants. Thus, an appreciable saving in work is effected. Reports were issued in October, 1944, January, 1945, March,

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LIGHT PORTABLE–1½H.P. –Complete and positive separation precedes the vacuum producer.

Thorough removal of industrial dust, dirt and litter, in less time, with less labor (and therefore at less cost) is achieved by Invincible Vacuum Cleaners. Even hard-to-reach spots are readily cleaned by these rugged machines and their handy attachment tools. Such complete cleaning insures better working conditions for your men, and less "dust-damage" to your equipment or product. That is why Invincibles in industry quickly pay for themselves.

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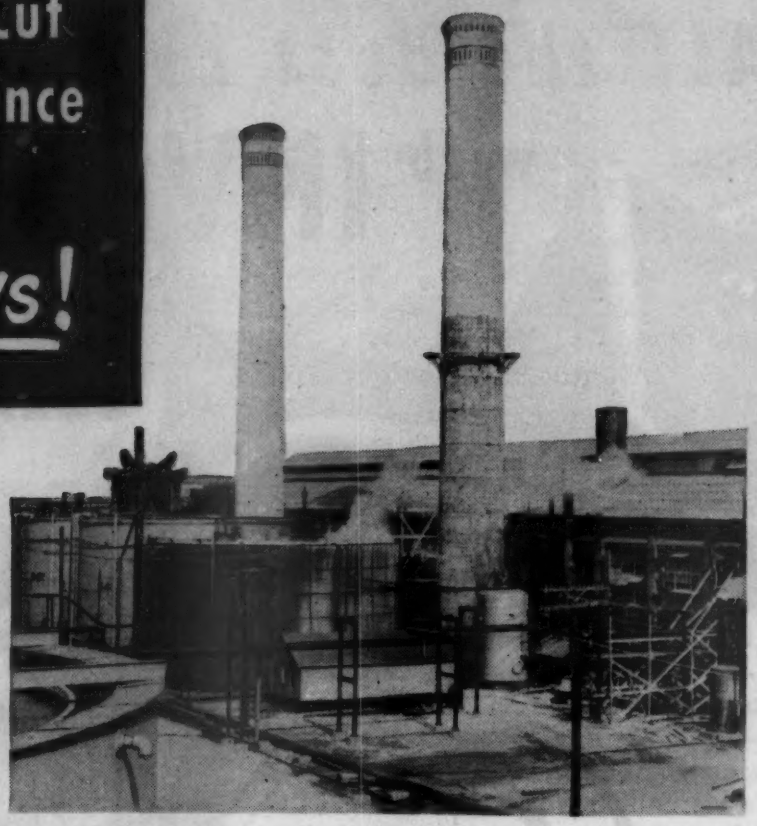

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PROTECT STACK SURFACES... Subjected to every climatic change, plus extreme conditions of vibration and high temperatures, stacks are a frequent and continuing source of maintenance expense. That is until they are protected by a tough, long-lasting coating of Arco Stack Dum Dum. Then they shrug off weather and other maintenance-provoking conditions because Stack Dum Dum's elastic coating permits ample expansion and contraction to withstand heat, cold and vibration.

PROTECT BUILDING SURFACES... Where cracks appear in concrete, stucco or other masonry building surfaces, it's time to apply a thick, tough but elastic coating of Dum Dum Masonoc. This time-proved Arco product seals cracks, stops moisture seepage and prevents the need for much costly reconstruction.

PROTECT METAL SURFACES... Dum Dum for Metal protects any metal surface against the hazards of rust, corrosion, weather wear... even industrial fumes and gases.

FOR COMPLETE INFORMATION ON ALL 3 PRODUCTS—MAIL THIS COUPON TODAY

THE ARCO COMPANY
Dept. FM6, 7301 Bessemer Ave., Cleveland 4, Ohio

☐ Please send booklets describing Stack Dum Dum, Dum Dum Masonoc, Dum Dum for Metal.

☐ Please supply names of appliers operating in this locality.

☐ Please have sales representative call.

Name_____

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SPECIFY ARCO

THE ARCO COMPANY
CLEVELAND • LOS ANGELES

1947, and a fourth questionnaire was distributed early in 1948.

Participants

Participation is open to industrial concerns which have members in one of the two personnel organizations. Sixty-eight companies participated in the last study. These companies employ over one-third of the industrial wage earners in Cleveland. Distribution of the report is limited to companies which participated by submitting data.

Scope of Survey

There is danger in having a sample either too small or too large. Attention was paid to size and type of companies asked to contribute information in order to secure a representative picture. On the other hand, it was advisable to place some limit on the number of companies that could participate. The reason for this was twofold: (1) Mechanical difficulties involved in calculation of answers; and (2) after a certain point, additional companies did not add anything to the picture.

How is information supplied to be used? This must be clearly defined so that contributing companies know exactly how data they supply will be used. It is important for the agency that handles the mechanics to follow the rules closely, and not take liberties without consulting contributors.

Coding

Under the Cleveland survey, companies that supply information on their personnel practices may identify the practices of each of the other participating companies through a code index to their report. This code index is available only to contributors.

How to Start

The Cleveland group has suggested this sequence of operations for groups desiring to undertake a similar study:

1. Have some local agency, either a chamber of commerce or a personnel association, agree to act as a clearing house and handle mechanical details.

2. Develop a questionnaire, including subjects in which there is continuing interest. State the questions in a manner to draw brief, specific answers. These are most easily understood and tabulated.

3. Follow up on data requested in the questionnaires. Prompt preparation and distribution of the report is important.

4. Distribute a clear, concise re-

The CONE AUTOMATIC MACHINE COMPANY
Soon may
GOOD THINGS AHEAD

It is reported that . . . . . .

To prevent explosions caused by sparks, Emil Greiner Co., 161 6th Ave., N. Y., offers an industrial mixer driven by air pressure.

get ready with CONE for tomorrow

Ford Motor Co. makes dies of a bismuth-tin-lead alloy which is very soft and easily formed. When chilled to –320° F. in liquid nitrogen, the metal is hard enough for use in six to ten stampings.

be ready with CONE for today

A machine that records magnetically and automatically in code is made by Codit Co. of 3535 Dell Trail, Chattanooga. The record can be played back intelligibly only on another machine set for the same code.

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Metal "super crystals" are being made in the laboratory of the University of Virginia. They are as large as an inch in diameter, but have the same characteristics as the usual microscopic crystals.

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A new thermometer made by Leeds & Northrup of Philadelphia measures temperatures down to 10 K with an accuracy of one hundredth of a degree.

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Hycar P. A. is a new synthetic rubber made by B. F. Goodrich which has been tested at temperatures up to 400° F. without apparent loss in properties.

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Plastic clamps to support wires or tubes are made by Holub Industries, Inc. They guard against cutting insulation and are nonconducting.

Associated Battery Assemblers have an automobile battery that can be taken apart, repaired and reassembled in 15 minutes.

get ready with CONE for tomorrow

Plastic gas pipe made of Tennessee Eastman's Tenite is replacing iron pipe in many installations.

be ready with CONE for today

California Institute of Technology is testing a "sweat cooling" system for jet engines. Coolant is forced through porous metal walls and cools by evaporation.

get ready with CONE for tomorrow

S. S. White Dental Co. is making dentists' burrs of cemented carbide.

Stanolind Oil & Gas Co. will soon start production of motor fuel and other products from natural gas at Garden City, Kansas.

be ready with CONE for today

The purest helium ever distributed commercially (98.8% pure) will be made available by the U. S. Bureau of Mines. It will be known as "welding grade."

get ready with CONE for tomorrow

Paper pulp from southern New England and New York hardwoods is possible with a process developed at Polytechnic Institute of Technology.

be ready with CONE for today

U. S. Rubber is making an insulation material of foamed ureaformaldehyde that weighs only eight-tenths of a pound per cubic foot.

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Magnesium alloys with twice the strength of those currently in use have been announced by the U. S. Army Corps of Engineers.

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To get it faster look in

SWEET'S FILE

One hundred and ninety-five manufacturers' catalogs—1,520 catalog pages—instantly accessible in the 1948 Sweet's File for the Process Industries. There, right in your office, you will find up-to-date, useful and comprehensive information on forms, characteristics, performance and use of a wide range of materials, equipments and services.

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port. Bear in mind that all shades of meaning cannot be demonstrated. Endeavor to give contributors as much helpful information as possible.

AUSTRALIAN GOVERNMENT ISSUES HANDLING BOOKS

McGRAW-HILL WORLD NEWS, Melbourne

To continue and extend the work done during the war years on modern methods of handling and storing all kinds of materials, the Department of Post-War Reconstruction some time ago set up a Materials Handling Bureau. The results of these studies in the techniques and practices of materials handling have been embodied in a 500-page book.

In addition, the Bureau is publishing a series of well-printed and profusely illustrated monographs on specific phases of materials handling. Four have been issued so far: No. 1 deals with unit loading with the fork truck; No. 2 discusses pallets; No. 3, warehouse improvements; and No. 4 illustrates materials handling methods in the building industry.

WHY THE IMPORTANCE OF COSTS MUST BE RECOGNIZED

ARNOLD K. BROWN, Vice-President, Brown & Sharpe Manufacturing Company, speaking before the National Machine Tool Builders Association

What we term cost is the price of doing business. If the price gets too high, the business fails.

Neither the proposition just stated nor its corollary is a new discovery. Both have been demonstrated countless times since the first man set up to make stone hatchets for his neighbors.

They are elementary. They are simple. They are also immutable, as many have become painfully aware over the centuries.

Obviously, then, the enterprise that expects to succeed must place above all other interests—first, recognition of the elements that constitute the price of doing business; and, second, resolution so to regulate those elements that the price of doing business does not smother the business itself.

As the articles that men make and use have become more complex, so has the matter of recognition—determination—of cost become more difficult, and more important. Unfortunately, the rapid growth of production, of which we should be proud, and the resulting multiplicity of cost factors, with which by diligence we might be expected to cope, are not all that confront the modern business man.

While enterprise has gradually

SKYCO NO-GLARE

SKYCO NO-GLARE acts like a sun shade over your plant because it keeps out glare, admits 94 per cent of the natural light and reduces inside summer temperatures approximately 15 per cent. SKYCO NO-GLARE is light blue and may be brushed or sprayed. It is easily removed when necessary, and very economical . . . single gallons $3.50, 5 gallon pail $3.25 per gallon, f.o.b. Cleveland. Orders shipped the same day received. Order a trial supply today.

Write to department A. Used for Over 20 Years and Manufactured Only By

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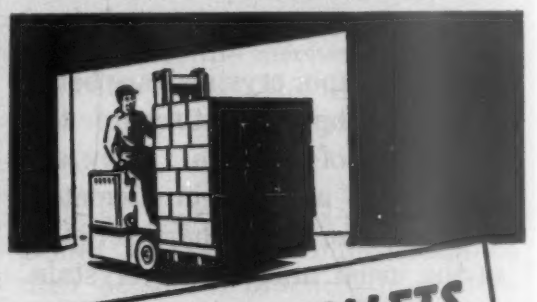
3125 Perkins Ave. * * * Cleveland 14, Ohio



BUY YOUR PALLETS DIRECT FROM THE MILL

. . . and Save!

48" x 48" Standard hardwood pallets $2.98 each.

Write for prices on special size pallets hardwood or pine. All prices F. O. B. Winona, Texas. Prices slightly higher on LCL shipments. Approximately 350 48" x 48" pallets per car.

BOX 1, WINONA, TEXAS

ROSELAND
MANUFACTURING COMPANY
WINONA TEXAS

Architect: Reynolds, Smith & Hills; Contractor: George D. Auchter Company, Jacksonville, Florida

Fireproof Construction ... in a hurry!

Speed may not be the first requirement—but it's an important factor in many construction jobs these days.

It follows right on the heels of those prime requirements—good fireproof construction and low cost.

To get all three benefits, Fenestra* Metal Building Panels were specified for this building. 7,200 square feet of 1½"-deep Type D Panels were used as base for its built-up roof. 14,200 square feet of 3"-deep Type D Panels were used for the second and third floors, a concrete slab being poured over the panels and a suspended ceiling installed underneath for fireproof construction.

Fenestra Panels are quickly laid and interlocked without special skills or special tools. Other work can proceed without delay . . . the panels provide a flat surface that is ideal for wheeling in other materials.

Fenestra Building Panels are suitable for all types of buildings. They save construction time and money, not only in floors and ceilings, but also in walls, partitions and roofs. See Sweet's Architectural File for 1948 (Section 3c-1) or mail the coupon for full information. *Trademark

THESE NONCOMBUSTIBLE FENESTRA PANELS SPEED ALL TYPES OF CONSTRUCTION

TYPE C FOR WALLS. Two metal members pressed together, with felt at each side to prevent metal-to-metal contact. Filled with insulation and closed at the ends, at the factory. Standardized in 3" depth and 16" width, in 18 gage painted steel or 16 B & S gage aluminum.

TYPE D FOR FLOORS. Box beam formed by welding together two steel sections. Side laps interlock to form continuous flat surface. Standardized in 16" width. Depth 1½" to 9". Gages 18 to 12. Type AD available with two flat surfaces.

HOLORIB ROOF DECK. Steel sheets reinforced by three integral triangular ribs on 6" centers. Flat surface for mopped application of insulation and roofing. 18" wide. Lengths to 24' to fit. Gages 18 and 20 are standard.

Fenestra
BUILDING PANELS FOR ROOFS WALLS FLOORS

DETROIT STEEL PRODUCTS COMPANY
Building Panels Division
Dept. FM-6, 2266 E. Grand Boulevard
Detroit 11, Michigan

Please send me, without obligation, information on Fenestra Building Panels.

Name_____

Company_____

Address_____

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If you use yarn, you should learn all about USTEX.

USTEX is a cotton yarn with unique characteristics. It has extremely high strength, low gauge and a minimum of stretch. It contains no sizing or bonding materials, and is chemically neutral.

USTEX Yarns have been developed which are from 70 to 90% stronger than conventional yarns.

USTEX yarns are now being used in the manufacture of aircraft webbings, hydraulic hose, high pressure air hose, spray hose, industrial sewing threads, commercial seine lines, safety belt webbing, V-Belts, transmission and conveyor belting, fire hose and many other products.

Investigate! USTEX yarns may help you cut costs or improve the performance of your products.

Test Sample Free—on Request! Send today for test sample and for information regarding interesting applications of USTEX yarns.

*A U.S. Royal TEXTILE

Product of Research of the Textile Division

UNITED STATES RUBBER COMPANY

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been losing its freedom in the last decade or more under government regulation, and gradually losing its life under that government's unwise fiscal policies; as social evolution has been legislated by those who fondly believe that "the better world" is merely a statutory condition; while wage rates, hours of work, prices, and even the selection of a working force have been solemnly discussed and capriciously shuffled about by men whose knowledge of any of these is largely academic—during this period, the operation of business has become a gigantic guessing game. And your only possible hope of guessing right is to be secure in knowledge of all the determinable cost elements in your business.

MANAGEMENT LEADERSHIP MUST REMAIN FLEXIBLE

ALVIN E. DODD, President, American Management Association, speaking before Chamber of Commerce of Philadelphia

Long-term climatic cycles tend to encourage a definite type of leadership peculiarly suited to each period.

Our depression of the 1930's called forth one type of business and political leadership; our war period demanded a different type. Periods of low interest rates require the abilities of one kind of administration; high interest rates, competence of another sort.

The economic and social forces that require new leadership are inexorable; they cannot be bought. The individual who is best fitted will gain the ascendancy or, inevitably, the enterprise will become less prosperous, or even go under completely.

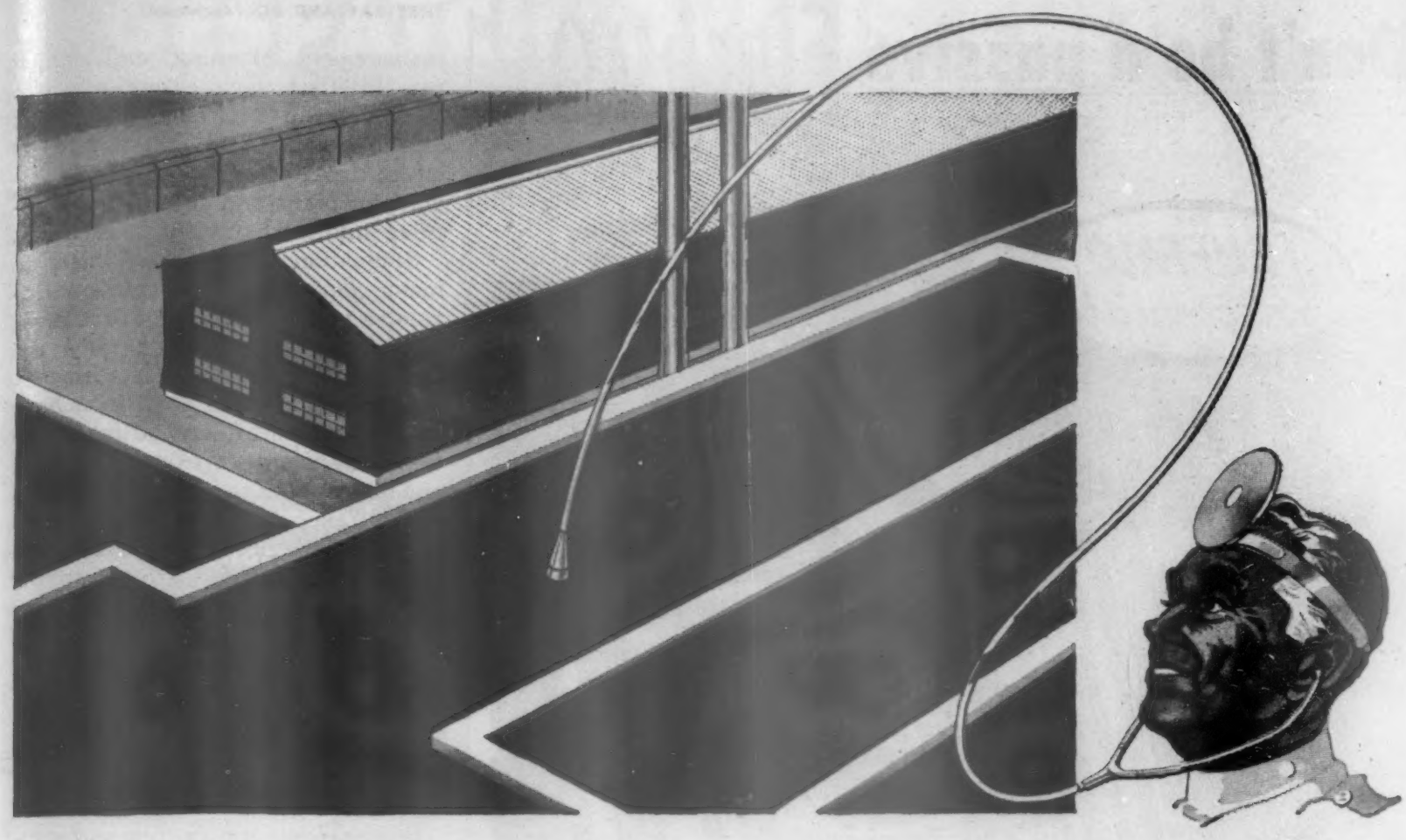
It is this very fact that makes our free enterprise system the most progressive in the world. Because the system puts a premium on flexibility, it insures that no individual or group of individuals can very long block advances. If one organization declines to take advantage of new developments, there are others that will; and only those that do can hope to survive in the competitive marketplace.

The solution does not lie in changing the man at the helm every time there is a change in the business barometer.

Rather, the objective should be to develop a flexibility in top management that permits continuous and automatic adjustment—to have a multiple type of leadership, or a leader with advisers, and a leader who takes their advice.

Techniques that foster this type of leadership have been developed.

One of these techniques is the top



. . . has your *roof* seen a *doctor* lately?

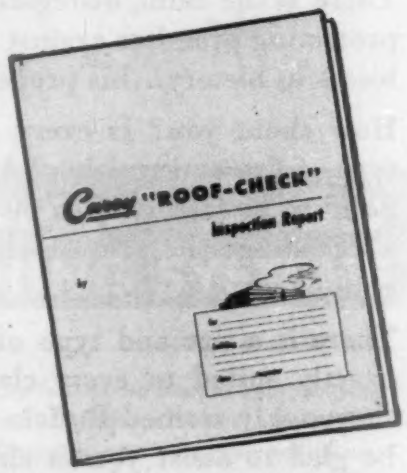
announcing a Carey service you can't afford to miss

NOW *a Free "Roof-Check" Service* is offered by **CAREY.** Here's what it is and how it works.

THE BASIS — Carey laboratory technicians and roofing engineers, backed by 75 years of experience in serving the roofing needs of American Industry, developed the **CAREY** "Roof-Check" method. It applies to all types of roofs. It is a scientific method of analyzing roof conditions which more and more industrials are using to assure maximum service at minimum cost from existing roofs.

THE PROCEDURE—You simply ask for a Carey "Roof-Check" survey of your property. A roof specialist does the rest. There is no obligation.

THE RESULT—You get a complete written report of the condition of your roof. It gives you detailed information about your roof and includes data on condition of flashings, parapet walls, gutters and all spots where trouble may start. It tells what, if any, maintenance or repair is needed, and the approximate cost. If none is required, the report says so.



"ROOF-CHECK" is a professional diagnosis for existing roofs. It has been created to help building owners understand and appreciate roof maintenance and to provide better longer-lasting roofs at lower overall costs.

75 years serving home and industry **Carey**

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Don't be a passive Firebug

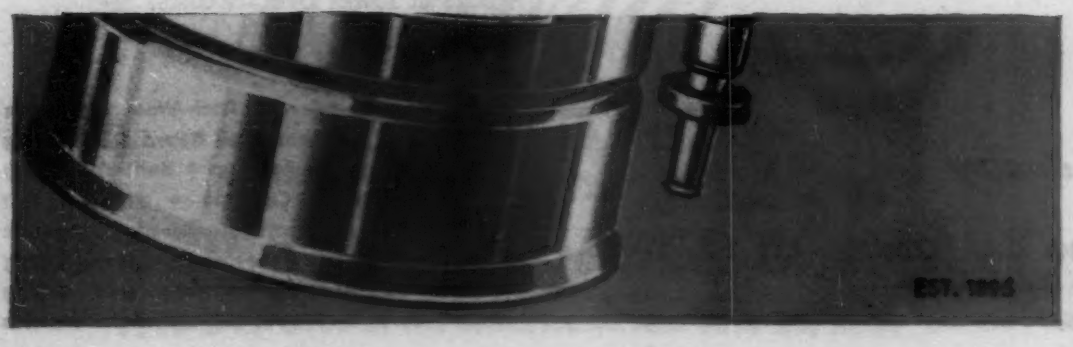
● We don't have to describe the *active* firebug. Everybody knows of this maniacal type. Everybody is eager to detect him, to get him put away.

There is the calm, disregardless type, too. The man responsible for protecting premises against fires, but who feels...despite highest fire losses in history...his property will stay immune.

How about you? Is every vulnerable spot protected by the right type of fire extinguisher? Approved protective practice calls for no point to be farther than 50 UNOBSTRUCTED feet from a dependable extinguisher. Now is the time to double check your fire-fighting equipment.

There is a size and type of Buffalo *better-built* Fire Extinguisher exactly suited to every class of fire hazard. There probably is a thoroughly trained Buffalo representative in your locality who will be glad to assist you in checking your Fire-fighting equipment. If he is not listed in your classified telephone directory, please write us direct.

BUFFALO FIRE APPLIANCE
CORPORATION
DAYTON 1, OHIO



management planning staff, which acts, in effect, as an extension of the person of the chief executive. It has no line duties and can devote its entire time to studying problems, developing plans, and keeping the executive informed of new possibilities.

Stagnation is combated also, in many companies, by attempts to develop a greater number of executives who know something besides the business of their own departments.

In some instances, companies have gone so far as to arrange for systematic transfers of executives from one department to another. They call it the "executive merry-go-round."

Another device is the policy committee. Often, there are a number of committees at various levels to pass recommendations upward. Even first-line supervisors may be given an actual share in shaping policies that affect them.

Devices have been developed also for consultation of the rank and file. A suggestion system is common in industry today; the attitude and opinion survey appears to be growing in popularity. Some companies go further and conduct special interviewing programs, or obtain employees' suggestions through various types of committees.

CENSUS OF MANUFACTURERS NOW BEING MADE

A full-scale census of manufacturers, the first in eight years, is being undertaken by the Bureau of the Census, Department of Commerce. It will cover the 1947 industrial activity of approximately 250,000 establishments. The current census will measure the tremendous change in this country's manufacturing industries since 1939, when 184,230 establishments were listed. The many new plants and products developed during and following the war years will be covered. In addition, changes in older industries will be measured.

PLANTS ASKED TO SET OWN WAR CAPACITY

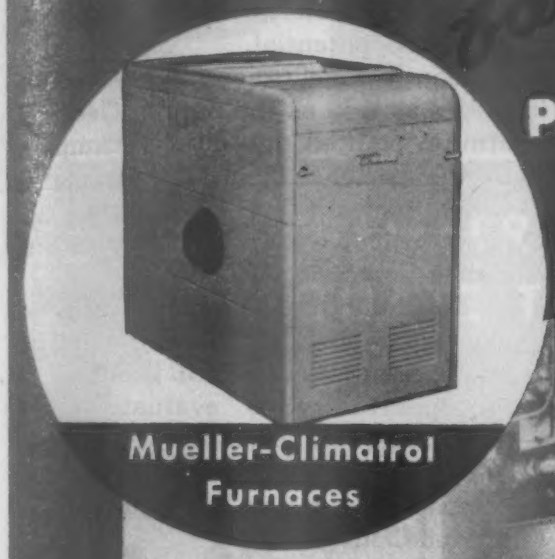
A plan whereby each of the nation's 86,000 industrial plants would immediately determine its own potential for munitions production in a war emergency was recently advanced by Gen. Hugh C. Minton, vice-president of Koppers Company, Inc., Pittsburgh, and a director of the Army Service Forces Production Division during World War II.

He explained that such a program would be "a great patriotic job and fulfill industry's responsibilities as a

DESPATCH OVENS CHOSEN

for uniform finish...and

PRODUCTION WAS BOOSTED 35% ..FUEL COSTS CUT 45%



Mueller-Climatrol Furnaces

ADVANTAGES OF DESPATCH Ovens As Rated By L. J. Mueller Furnace Co.

1. Bakes Faster
2. Cuts Baking Costs
3. Uniform Baking
4. Safety
5. Rugged Construction
6. Saves Floor Space
7. Low Orginal Cost
8. Saves Labor

When they wanted more uniform finish baking of their famous *Climatrol* furnaces, L. J. Mueller Co. of Milwaukee installed two DESPATCH automatically controlled, forced convection, gas fired ovens. *Result:* better finishing, and a bonus of 35% more production and 45% lower fuel costs.

Baking a wrinkle finish on 20 gauge steel panels for home air conditioning furnaces requires exact uniformity of color and texture. The finish must withstand rigorous conditions of heating, cooling, dampness, etc. Uniform heat distribution and exact temperature control give Mueller fast, high quality finishing.

For the two ovens, daily production is up to 30 loads in two 9½-hour shifts. Baking time is 1 hour at 265° F.

These ovens are typical of the 50,000 industrial heating, baking and drying installations made by DESPATCH in the past 46 years. DESPATCH builds industrial heat processing equipment from the smallest laboratory ovens to the largest mechanized systems. DESPATCH engineers can help you with your heat application problems.

WRITE TODAY **for latest Despatch bulletin 51-A**

DESPATCH *Designs - Builds* COMPLETE FINISHING SYSTEMS

Dip tank being used to apply finishes on bed springs before baking in a Despatch elevated type continuous conveyor oven.

A typical Despatch water wash spray booth for spraying finishes on motorcycle parts.

DESPATCH OVEN COMPANY

To be best evaluated, fire protection must be considered in the light of known results . . . results that can best be measured in terms of

ASSURED SERVICE . . .
APPROVED SAFETY . . .
ACCEPTED SAVINGS

Those three qualifications spell the difference between "Automatic" Sprinkler systems of fire protection and other makeshift protective equipments. The qualities of Assurance, Approval and Acceptance must be earned the hard way and, for "Automatic" Sprinkler, that way has been through more than 55 years of pioneering in the design, manufacture and installation of equipment that, on record, affords the best in fire safety.

Ohio properties, valued at better than three billion dollars, represent but a small percentage of the total valuation of "Automatic" Sprinkler protected properties, located from coast to coast and from Canada to South America. Satisfaction and known results have made "Automatic" Sprinklers the recognized first line of any fire defense. *They're an important investment today . . . perhaps welcomed protection tomorrow.*

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DEVELOPMENT • ENGINEERING MANUFACTURE • INSTALLATION

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA
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OFFICES IN PRINCIPAL CITIES OF NORTH and SOUTH AMERICA

part of the military might of the United States." According to General Minton, the military alone cannot adequately determine our national industrial potential.

Definite benefits accrue to the companies as well as the nation, General Minton pointed out, citing examples from experience of his own company which had placed such a plan in effect in its 53 plants throughout the country.

"For individual companies, all echelons of management, from plant manager to president, will be afforded an opportunity to evaluate plant equipment and processes, and to look into the future for new products the company is—or can be—equipped to produce," he said.

"With such a plan available, a company can check its own operations and determine internal weaknesses, correct these weaknesses, and perhaps place itself in a position to meet any 'rough going,' either in war production or when peacetime production becomes keener."

ANNUAL REPORT EXPLAINS HIDDEN BENEFITS

When the Allen Manufacturing Company, Hartford, Conn., presented its annual report to its job-holders, a poster-like presentation showed the workers what they got in 1947, and what they did in 1947.

Emphasis was placed on the hidden benefits which accrued to each worker, in addition to his actual wage earnings. Workers were shown a breakdown of their average earnings for a week and for the year. They learned that the average wage for hours worked constituted but 70.1 per cent of their total pay. The remaining 29.9 per cent was divided among the earned bonus, night premium, vacation pay, paid rest periods, wash-up time, and holiday pay.

In addition, they learned the company's contributions to the following amounted to 10.5 per cent more than regular earnings: Retirement plan share, unemployment insurance, old age benefits, group insurance premiums, workman's compensation insurance premiums, medical service, personnel service, and safety service.

In addition, the report showed jobholders what their performance was for the year 1947. For instance, they made more screws per hour, they earned more than the county average, the company and union worked together, Allen's family changed, two out of three employees were now past the 5-year mark, employees put

ONLY PHILLIPS RECESSED HEAD SCREWS

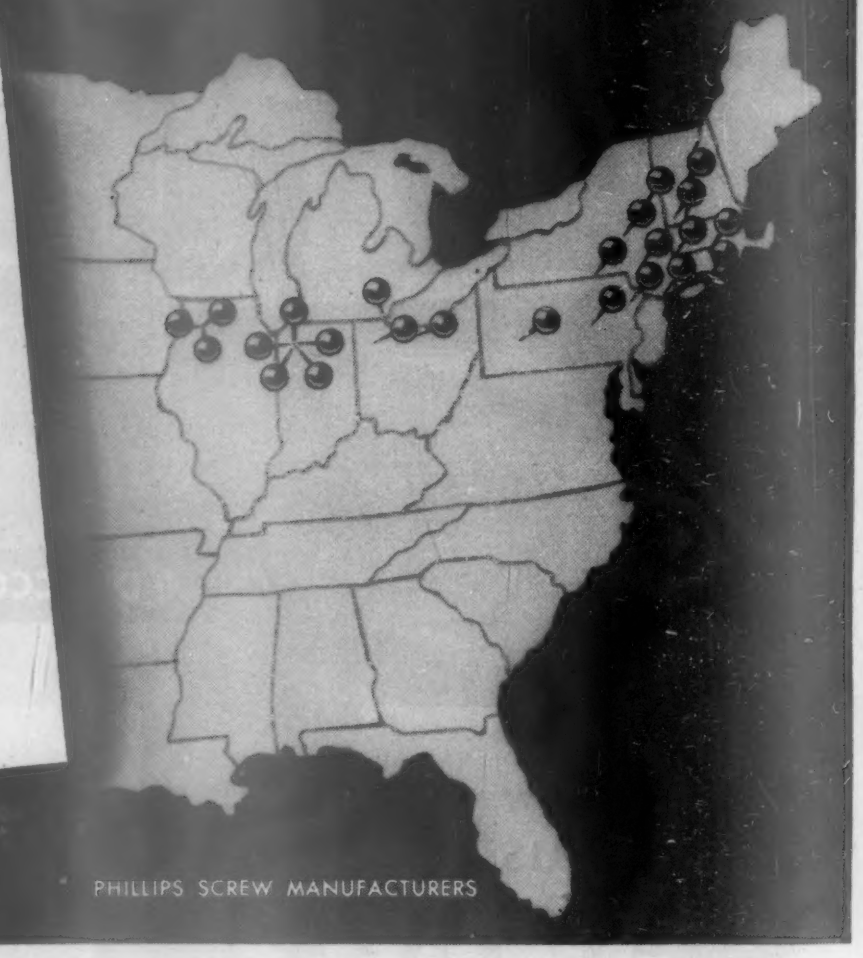
OFFER PRODUCTION POTENTIAL ADEQUATE TO MEET *ALL* INDUSTRY'S NEEDS

25 SOURCES OF SUPPLY FOR PHILLIPS SCREWS

are represented by the screw manufacturers listed below. These 25 plants have a production potential of many million screws per 8-hour day. In Canada, Great Britain, Europe, and South America ... Phillips Recessed Head Screws are also available from the leading screw manufacturers.

// MAKERS OF PHILLIPS HAND DRIVERS AND BITS

—plus 46 tool plants which assemble Phillips pointed driver bars into complete drivers, make Phillips Drivers available everywhere ... in hardware and chain stores, and industrial supply houses.



LOOK AHEAD when you choose a cross recessed head screw. Whatever the supply situation, at any time, this tremendous capacity makes Phillips Screws constantly available.

Wherever your product is sold and used, there are, and always will be Phillips Drivers available for disassembly and reassembly.

Remember, unlimited production potential is one of the basic essentials you can't afford to overlook in choosing a cross recessed head screw. With Phillips Screws, you can depend on it. Specify *Phillips*.

GET ALL THE ADVANTAGES OF ASSEMBLY WITH CROSS RECESSED HEAD SCREWS . . .

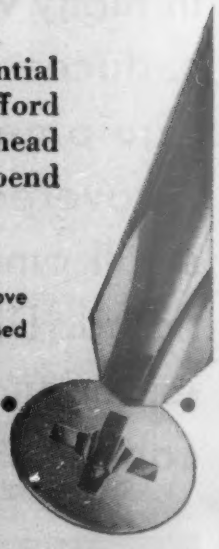
GET PHILLIPS *Recessed Head* SCREWS

Wood Screws · Machine Screws · Self-tapping Screws · Stove Bolts

25 SOURCES

American Screw Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products Inc.
Wales-Beech Corp.
Wolverine Bolt Company

GET THIS NEW BOOKLET of facts that prove the top value, top economy of Phillips Recessed Head Screws. It's free . . . use the coupon.



F-30

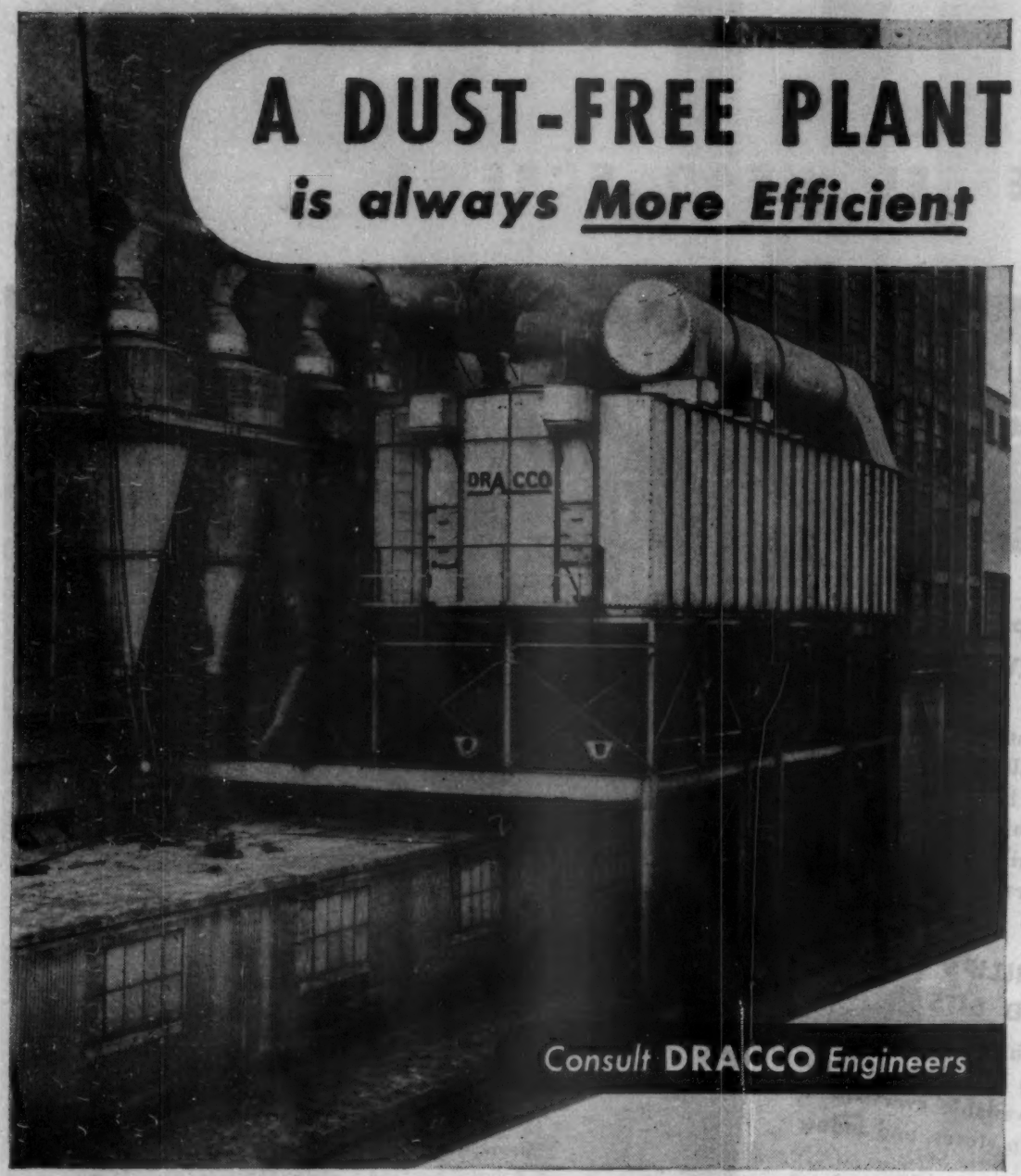
Phillips Screw Mfrs.,
c/o Horton-Noyes Co.
1800 Industrial Trust Bldg.
Providence, R. I.

Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

Name _____

Company _____

Address _____



No matter how well managed a Plant might be it must be DUST-FREE to attain MAXIMUM efficiency. DRACCO Dust Control increases efficiency in many ways — creates better working conditions, reduces maintenance cost and prolongs life of equipment. In many installations the material recovered makes a substantial saving. Even in small amounts dust is costly and should be eliminated. DRACCO Engineers have over 30 years experience in dust and fume control — why not consult them?

DRACCO CORPORATION

4091 E. 116th St., Cleveland 5, Ohio *New York Office:* 130 W. 42nd St.

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

safety first, there was more sickness, poorer attendance, more benefits were gained from group insurance, employees handed in fewer good ideas, and employees as a whole added to their savings.

Copies of the report were sent also to Hartford community leaders.

BEHIND THE BYLINE

Facts About *Factory's* Authors

J. M. Scarlett (page 74) entered the apprentice course of General Electric Company in September, 1921, After finishing the course he entered the Carnegie Institute of Technology, being graduated in 1929 with a B.S. in mechanical engineering. In 1929 he again started working for General Electric on a factory training course. Scarlett was appointed a foreman in 1930; general foreman in 1934; assistant superintendent in 1936; and superintendent of the refrigerator cabinet division in 1941.

H. A. Klingenberger, (page 78) plant manager of the Sandusky division of the Apex Electrical Manufacturing Company, served in the maintenance shops of the Pennsylvania Railroad. There he completed his apprenticeship as machinist and toolmaker. He left the railroad shops to become general foreman of machine shops and refrigerator assembly for the Wayne Home Equipment Company. Klingenberger moved to Cleveland as general foreman on refrigerators when Wayne became part of Apex and rose to general foreman of cleaner, refrigerator, and motor production at Sandusky. He became general superintendent of all production, and in 1943 became plant manager

Malcolm W. Eaton (page 82) is secretary-treasurer of Micro Switch Division, with charge of industrial relations. He spent many years in mechanical and

STOP FIGHTING
WITH FITTINGS

• Start . . . stop . . . back off . . . try again. Running pipe under those conditions raises blood pressures and frays tempers.

But nobody loses his temper when Spang CW Pipe with machine threaded ends is used with high quality fittings. Modern, precision machine tools and inspection methods make sure the lead, taper and depth of these threads are accurate. The results are smooth, fast make-up and trouble-free joints.

Make your jobs run smoothly with Spang CW . . . the pipe that's famous for the following qualities:

• Easy to Cut, Bend, Thread or Weld • Uniform Lengths • Smooth Inside Surface • Sound Weld from End-to-End of Pipe • Accurate Threaded Ends • Accurate Size • High Concentricity.

In spite of shortages your dependable Spang Distributor will do everything possible to speed delivery of your orders for Spang CW Pipe.

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IT'S Kellogg-American FOR

MORE COMPRESSED AIR POWER FOR LESS MONEY

10 H.P.
KELLOGG-AMERICAN
No. B-331-80
34.6 C.F.M. Actual free air delivery.
Other compressors with horsepower ratings from ¼ to 15. Electric motor and gasoline driven. Operating pressure up to 175 lbs.

Insured by ALL FOUR POINTS of Kellogg-American

OVER-ALL ECONOMY

1 MAXIMUM AIR DELIVERY... in cubic feet per kilowatt hour

plus

2 MAXIMUM AIR DELIVERY... in cubic feet per minute

plus

3 MAXIMUM MOTOR EFFICIENCY ...lower motor loads

plus

4 MAXIMUM MOTOR LIFE... lower motor loads

● Use a Kellogg-American air compressor and get *over-all efficiency* and *economy* as well as maximum air delivery. Kellogg-American operating costs are low . . . compressor life long and trouble-free, because of *lower average duty cycle motor loads . . . lower peak motor loads.* That's how a Kellogg-American Compressor gives you "more compressed air power for less money."

Write for information and literature. American Brake Shoe Company, Kellogg Division, Rochester 9, N. Y.

A PRODUCT OF

AMERICAN Brake Shoe COMPANY — KELLOGG DIVISION

electrical manufacturing, principally in production and engineering. At the University of Iowa he majored in general engineering. Eaton was one of the founders of the original Micro Switch Corporation and holds several of the patents on its products. His principal diversion, in his leisure hours, is working in his home toolroom.

A. R. Collins (page 84) joined the Stewart-Warner Corporation in 1942 as an engineer. He became manufacturing and engineering head of the South Wind Heater Division in mid-1947. Prior to this appointment, he headed the research department of the Heater Division for more than three years. He is a graduate of the University of California.

W. Weathers Sale, (page 88) recently named electrical engineer at the Reynolds Metals Company Plant No. 1, has followed the progress of electrical installations at his plant since 1919, when he first came with Reynolds. It was largely through the study of methods of combating the low power factor at his plant that electrical capacitors were installed, and that power factor correction was effected. In addition to working with electrical problems in his own plant, he helped set up electrical installations at all of Reynolds' nine other plants in the Louisville area. Prior to coming with Reynolds, Sale spent several years in electrical work with different railroads and contracting firms. A native of Louisville, he attended the Louisville Male High School, Du Pont Manual Training High School, and the University of Louisville.

John E. Kane (page 97) specialized in business administration at Rider College. The years 1936 and 1937 found him in the real estate and insurance business. He then became a manager in the Childs

Turning a bakery's paper losses into **REAL PROFITS**

INVESTIGATE HOW THERMOTECHNICS CAN MAKE *YOUR* TEMPERATURE VARIABLES CONSTANT

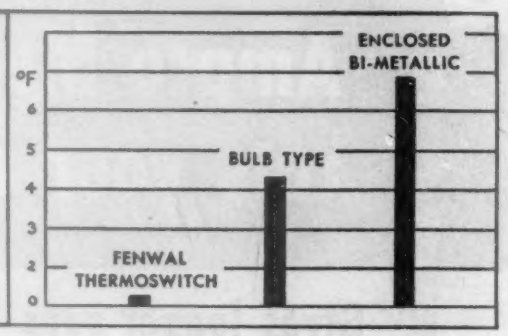
When uncontrolled electric heat on a bread-wrapping machine repeatedly set fire to the wax paper, this bakery called on Fenwal for automatic heat control. Thermotechnics solved the problem with a properly applied cartridge THERMOSWITCH* Control. This result of Thermotechnics suggests that you, too, can benefit from Fenwal's broad experience in temperature control and detection.

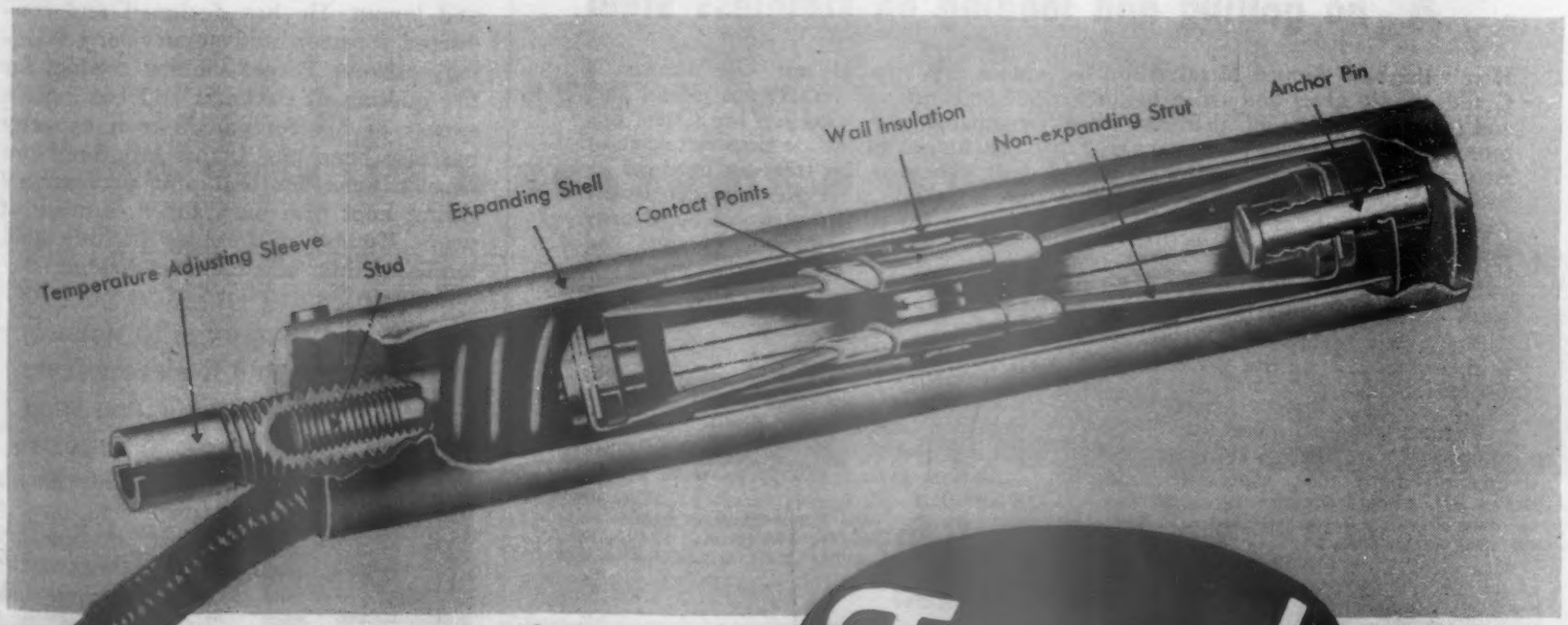
ELEVEN THERMOSWITCH* TYPES COVER MANY APPLICATIONS

Wherever you require a sensitive thermostat with low thermal lag, complete enclosure against dust, gases and vapors, and high resistance to vibration, the chances are there's a standard THERMOSWITCH* Control to do the job. Capable of holding temperatures from —100° to 600° F. under close control, THERMOSWITCH* Controls come in types that are easily inserted into closed gas or liquid systems; applied to incubators, ovens, ducts, warming and cooling cabinets, etc.; submerged in liquids or vapors; and in all-purpose types for many laboratory and industrial applications.

BUILT TO STAND ABUSE

Showing the change in the set point of a THERMOSWITCH* Control in comparison to two other types of thermostat when subjected to a mechanical shock of 100 G.





WRITE FOR LITERATURE

A comprehensive bulletin gives detailed specifications, test results and application data about Fenwal THERMOSWITCH* Controls. Write for your copy today. Fenwal, Incorporated, 23 Pleasant Street, Ashland, Mass.

Fenwal

THERMOSWITCH*

Temperature Controls . . . Over-Heat and Fire Detectors

SENSITIVE . . . *but only to heat*

*Reg. U.S. Pat. Off.

A new inter-metallic compound in Grade 24 Ampco Metal results in longer runs for drawing dies such as these — in most cases many times longer than steel dies — before re-dressing.
Die-hard
Ampco Metal Grade 24
cuts your drawing costs
Gives longer runs before re-dressing —
no galling and loading on stainless steel

Here's the new Ampco Metal Alloy — Grade 24. It gives you more hardness and compressive strength than any other bronze — even more than Grade 22 Ampco Metal which you have used for your drawing and forming work in the past. Machinability of Grade 24 is about the same as that of Grade 22.

Dozens of disinterested shops have already tested this new alloy in die work. They *proved* that Grade 24 gives you 2 to 5 times the die life previously considered standard.

These tests also proved that Grade 24 Ampco Metal dies are superior to steel dies on many jobs, especially stainless steel. A typical test case showed a 77,000 run on an Ampco Metal die, compared to a 3000 run on a steel die. The Ampco Metal die does not seize or gall. There is less frequent need for re-dressing. As a result, you get longer runs at lower cost. Actual superiority varies according to die-tolerances and working stock.

Plan now to get more work per dollar from your dies. Use the longer-run advantages of Grade 24 Ampco Metal to avoid investment in more expensive carbide dies. See your nearby Ampco engineer today, for the complete cost-cutting story on Grade 24! Write for bulletins giving complete data today.

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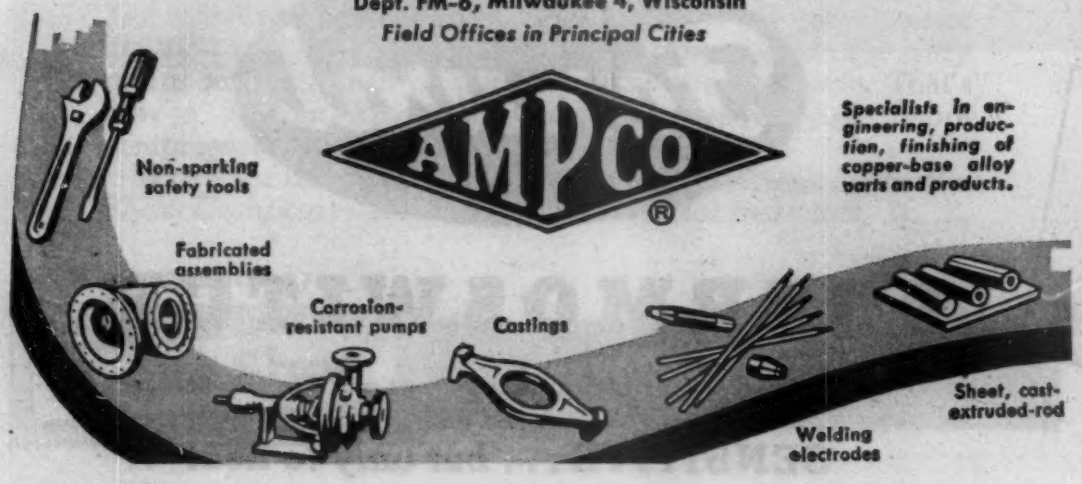
Field Offices in Principal Cities



BEHIND THE BYLINE *(continued)*

Restaurant until 1939, when he joined General Motors Corporation. Until 1942 he was with the Ternstedt Division. From there he went to the Eastern Aircraft-Trenton Division. Following that, he rejoined Fisher Body-Ternsted. He has served as personnel supervisor, personnel manager, industrial relations specialist, and his present job, supervisor of safety. Kane is a member of the American Society of Safety Engineers; former secretary of the Atlantic Seaboard Aircraft Safety Council; and is president of the Industrial Safety Council of Central New Jersey.

A Behind the Byline biography for Frank M. Brandon (page 102) appeared in the November, 1947 issue of FACTORY on page 256. Brandon became vice-president in charge of production in 1947.

Douglas Haynes (page 110) is head of planning, scheduling, and dispatching for production under direction of the production manager in the Watertown plant of Manning, Maxwell & Moore. Haynes has had close contact with setting up foundry production control system and analysis of tool crib system and layout. He has designed and conducted foremen and supervisory training sessions. Direct vendor contact for the making of patterns and castings in excess of his company's own capacity has also been part of his job. Semi-pro baseball and football and professional skiing kept him busy for a number of years. Today his hobbies include golf, tennis, skiing, and contract bridge.

C. E. Lauterbach's (page 113) early youth was spent at hard labor in his father's brick yard. In 1911 he was granted a B.S. degree at Iowa Wesleyan College. After graduation he taught school. During World War I, he served on the Mexican border and later was commissioned in the Q.M.C. with the eventual rank of first lieutenant. After the war he received an M.A. degree at University of Wisconsin, with advanced work at University of Colorado and Columbia. Then industrial engineering at California Institute of Technology, and employment with the W. J. Voit Rubber Cor-

IT'S "t.f.e."

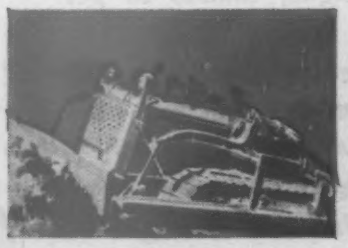
TO SPECIFY A BRAND OF *KNOWN* DEPENDABILITY

The only thing you can gain by buying nuts on "price" alone is an *illusion* of saving. When you buy on the basis of *total* fastening cost, your *actual* savings far exceed the amount of an imagined one.

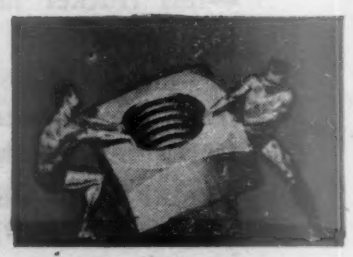
RB&W builds into nuts (and other fasteners) the "know-how" from 103 years of fastener experience, developments of an outstanding research staff, and the benefits of the most modern machinery. This means substantial savings to you in time, money and dependability.

In addition, RB&W's quality control over production assures that *each* nut (bolt, screw, rivet or special) is fully capable of playing its part in *True Fastener Economy*.

TIME—Holes repunched clean and true—tapped in latest-design tappers—insure accurate and uniform thread formation for quick run-on.



MONEY—Cold-working of the metal also increases its density for greater load-carrying—maximum holding per dollar of initial cost.



DEPENDABILITY—The RB&W cold-punching process in itself insures a sound product, free from structural defect.

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TRUE FASTENER ECONOMY
IS THE LOWEST TOTAL OF ALL
FASTENING COSTS

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THE COMPLETE QUALITY LINE
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Takes a Giant Load

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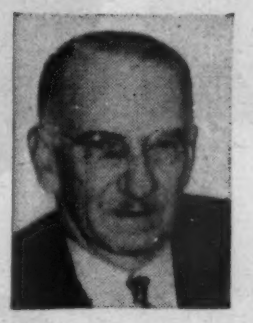
Ask For *American* Hand Truck Bulletin — 50 styles and sizes.

poration, where he organized the standards department. Lauterbach's hobby is the Twenty-third Psalm. His collection contains some 300 versions, paraphrases, and metrical arrangements, along with illustrative material and books.

A Behind the Byline biography for C. Frederic Hedlund (page 116) appeared in the July, 1947, issue of FACTORY on page 262. Hedlund is now head of the electrical division and takes an active part in committee work on the National Electrical Code and the American Institute of Electrical Engineers. He is the author of numerous technical magazine articles and a book on the "Protection of Electrical Circuits and Machines." In addition, he is a member of the International Association of Electrical Inspectors.



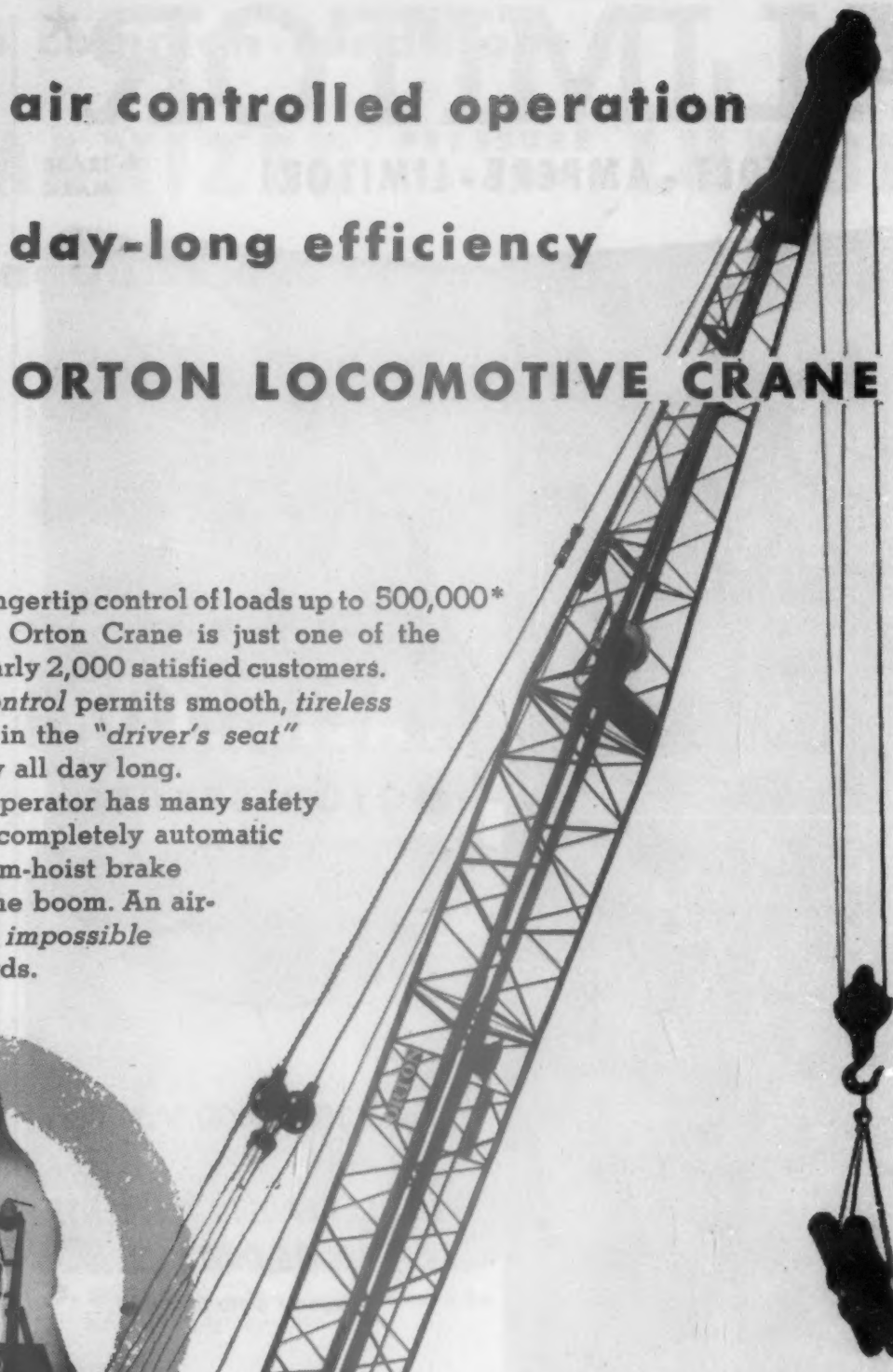
Glenn C. Gridley (page 120) graduated from Beloit Academy and began work for the Chicago-Milwaukee-St. Paul Railroad Company. At one time he was straw boss for a track-laying gang. Leaving his railroad job, he enrolled in the Law School of Wisconsin University. After one year of study, he left the University to accept a position with the Fairbanks-Morse Company. In 1916 he left the Beloit concern to begin his career at Mechanics. His first job was that of clerk in the production planning department. In 1920 he became head of the department. It was in 1937 that he became works manager. He was elevated to vice-presidency in 1940, and was made president in 1942. Gridley is a member of the Automobile Old Timers and the Society of Automotive Engineers.

Stan Johnston (page 122) attended Bliss College, and took advance work in time study at Case School of Applied Science. In 1937 he joined the V. H. Hill Management Consulting Company as a consulting engineer. He became time study engineer with Cleveland Tractor Company in 1939. The next year found him in the same capacity at Thompson Products, Inc. Johnston has advanced through the positions of estimator, assistant standards chief, and head of standards department. Now he is industrial engineer for the valve and jet division. His hobbies are hunting, fishing, and golf.

smooth, safe . . . air controlled operation

means . . . day-long efficiency

with the . . . ORTON LOCOMOTIVE CRANE



• Effortless, fingertip control of loads up to 500,000* pounds by the operator of an Orton Crane is just one of the many reasons why Orton has nearly 2,000 satisfied customers.

• Orton *air control* permits smooth, *tireless* operation of clutches. The man in the *"driver's seat"* retains early morning efficiency all day long.

• The Orton operator has many safety features upon which to rely. A completely automatic spring-applied air-released boom-hoist brake *positively prevents* dropping the boom. An air-controlled limit switch *makes impossible* pulling the boom over backwards.

• Every Orton Crane is built with anti-friction bearings on all power shafts . . . Gears and shafts remain in permanent, rigid alignment throughout the life of the crane . . . An independent transmission with built-in reverse, built by Orton for crane work only, makes possible lowering of heavy loads *against compression of the engine* . . . Single-point adjustment, burn-proof V-type "Orcoin" block clutches can not get out of round. Overheating cannot hurt them.

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* Note deep, short-coupled car body on Orton Model 150 Locomotive Crane, illustrated. Most rigid car body of any locomotive crane built. Operator has clear view of load and path of swing at all times.

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(VOLT - AMPERE - LIMITOR) ★ TRADE MARK

For 2300 - 4600 V. Motors

LIMITS "FAULT" CURRENTS TO 25,000 KVA

(steady state current)

These VALIMITOR Starters may be used *with safety* at *any* point on *any* power system regardless of the available KVA. Even if connected to a bus of *infinite* capacity, the short circuit KVA will be limited to a value easily interrupted by the starter-contactor.

Because VALIMITOR Starters limit the maximum possible fault current to approximately 25,000 KVA, damage to a short-circuited motor is limited. Also limited is the electro-magnetic forces on the starter, bus, cables and the entire high voltage system back to the power source.

There is nothing to replace, when a fault occurs. The magnetic overload relays on the VALIMITOR Starter promptly open the *high arc-rupturing capacity starter-contactor* to clear the line. *Don't worry* about the short-circuit possibilities your motor drives may be subjected to—*now or at some future date.*

For a specific problem, tell us ••

1-Type of motor (squirrel-cage, wound-rotor or synchronous)

2-HP, voltage, phase and frequency

3-Type of starter—*reduced* or *full* voltage starting—combination type or without disconnects.

NOTHING TO REPLACE . . . NO CHANGE LATER ON

THE ELECTRIC CONTROLLER & MFG. CO.

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BOOKS

PRINCIPLES OF PERSONNEL TESTING

C. H. LAWSHE, Jr., Professor of Psychology, Purdue University, McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. 227 pages. Tables, charts, graphs, appendixes A through C, index. $3.50.

One of the Industrial Organization and Management Series. A presentation of accepted procedures for selecting, validating and using personnel tests in business and industrial situations. Various types are discussed and analyzed, with examples indicating the kind of tests applicable to specific situations. Emphasis is laid on procedure rather than theory. Both advantages and limitations are discussed.

IMPROVED FOREMANSHIP

AUREN URIS, Editor, Supervisory Training Program, Research Institute of America. The Macmillan Co., 60 Fifth Ave., New York. 280 pages. Tables, charts. $3.50.

Information needed by foremen to prepare them for successful supervisory work is provided. Plant organization, production, cost, and quality control, interdepartmental relationships, personnel management, training, labor relations procedures, and human relations in general are some of the topics discussed. The book is written in narrative style, and reports a conversation between an average "foreman-in-the-making" and other members of his organization, taking up specific problems in day-to-day work, and the best methods to use in handling each one.

EFFECTIVE LABOR ARBITRATION

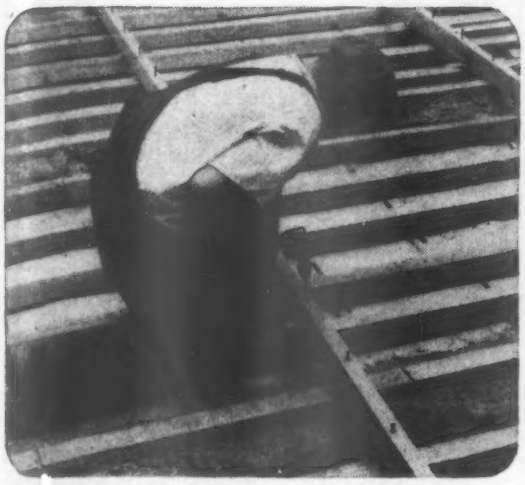
THOMAS KENNEDY, Assistant Professor of Industry, Wharton School of Finance and Commerce, University of Pennsylvania. University of Pennsylvania Press, 3446 Walnut St., Philadelphia 4. 286 pages. Tables, appendixes A and B, bibliography. $3.50.

Research Studies XXXIV. Subtitled "The Impartial Chairmanship of the Full-Fashioned Hosiery Industry." Reports the procedures, techniques, and principles of the system used by the Impartial Chairmanship of the hosiery industry to achieve the record of industrial peace it has maintained since 1929, when the Chairmanship was established. During this entire period there have been no authorized strikes in mills belonging to the Full-Fashioned Hosiery Manufacturers of America, and wildcat strikes have been virtually eliminated. The Chairmanship is a mediation and arbitration system voluntarily established and maintained by the employers' association and the American Federation of Hosiery Workers as a part of their national uniform labor contract. All problems that cannot be settled by arbitration are submitted to this group, and this book contains a detailed analysis of

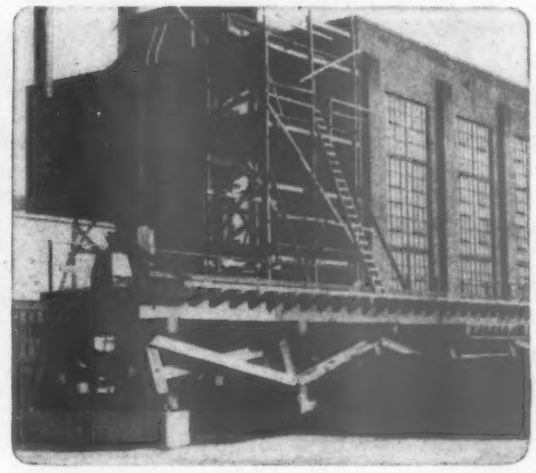
6 common conditions

where* WOLMANIZED PRESSURE TREATED LUMBER

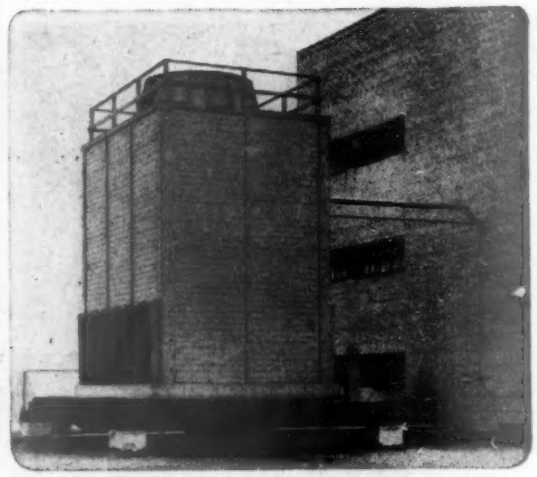
protects against DECAY and TERMITES



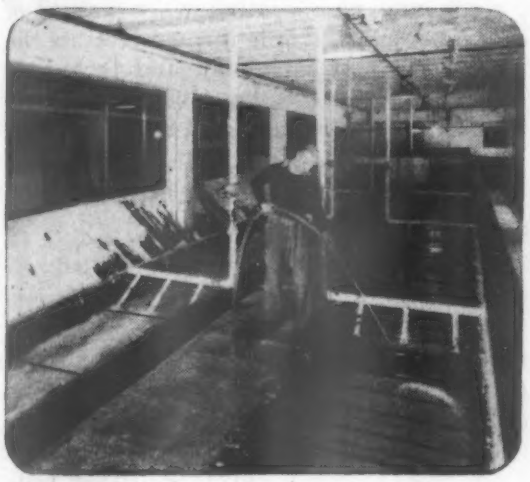
1. Wherever moisture is condensed because of concrete or masonry.



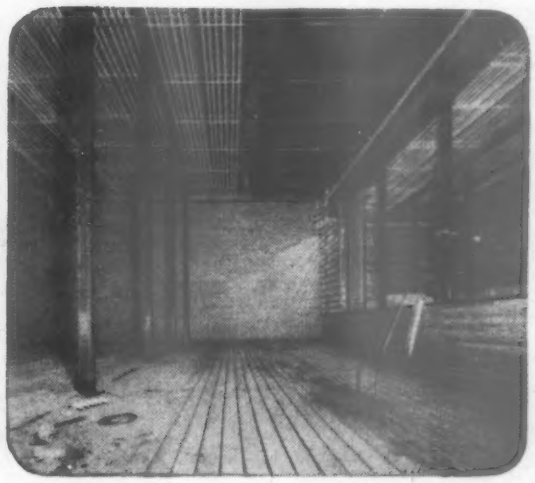
2. Ground moisture and rain held in joints, etc., of outdoor structures.



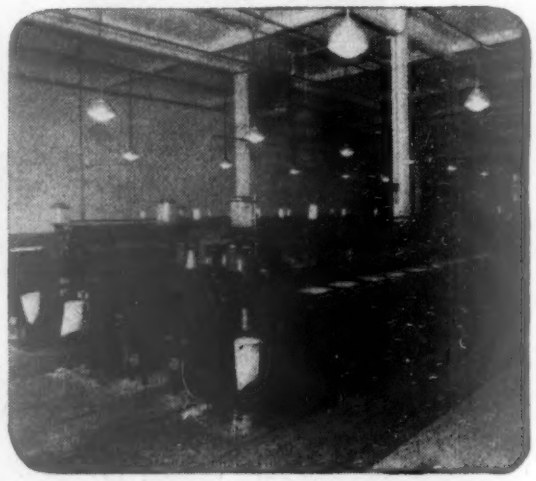
3. Cooling towers and similar structures exposed to direct water contact.



4. Where steam and vapor from industrial processes are prevalent.



5. Walls, floors, ceilings subject to condensation from refrigeration.



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Imagine the saving in maintenance which you could realize by using lumber which is protected against wood-decay and termites. "Wolmanized" pressure-treated lumber offers just such protection—lasts 3 to 5 times as long as ordinary wood.

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the 1566 grievances submitted for consideration from 1929 through August, 1945.

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ALEXANDER R. HERON. Standford University Press, Stanford, Calif. 197 pages. $2.75.

In probing for the answer to the question asked in the title, the author discusses: Management's Task; Unions Answer; Government Relations; Paralysis of the Motor Nerve; Are Foremen Different?; The Influence of Mobility; Subversive Influences; Featherbedding; Material Incentives; The Appeal of Status, and other topics. He endeavors to analyze failings of the past, to correct misconceptions of the present, and to forewarn of dangers ahead.

PRACTICAL JOB EVALUATION

PHILIP W. JONES. John Wiley & Sons, Inc., 440 Fourth Ave., New York. 304 pages. Photographs, tables, graphs, charts, supplementary reading list, sample forms, appendixes A through D. index. $4.

Discusses practical aspects of job evaluation, emphasizing the procedures necessary to determine characteristics of work and comparative wage values of various jobs. Sample forms illustrate the material, and each plan and technique included is said to have been used successfully in business and industry.

QUALITY CONTROL METHODS

CLIFFORD W. KENNEDY, Quality Control Engineer, Federal Products Corporation. Prentice-Hall, Inc., 70 Fifth Ave., New York 11. 243 pages. Tables, charts, graphs, formulas, examples, bibliography, appendix. $4.75.

Endeavors to present basic principles and primary concepts, as well as the more technical and involved practices required to reach effective quality control. Topics considered are: Acceptance Sampling; Batch Control—Per Cent Defective Methods; Distributions and the Standard Deviation; and Guide to the Administration of Methods.

FRACTIONAL-HORSEPOWER ELECTRIC MOTORS

CYRIL G. VEINOTT, B.S., E.E., Manager, Induction Motor Section, Small Motor Division, Westinghouse Electric Corporation. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. Second edition. 554 pages. Photographs, sketches, diagrams, tables, charts, formulas, bibliography, appendix, glossary, index. $5.

Designed for repair men, operating engineers, maintenance men, and salesmen in this field, this second edition brings completely revised information on how to repair, install, apply, inspect, sell, test, manufacture, and design fractional-horsepower motors according to standards set by ASA, NEMA, and AIEE. Descriptions of single-phase and split-phase induction motors, capacitor-start, repulsion-start, universal, polyphase induction, synchronous, direct-current, and many other types of motors. It also shows how to select the right motor for any specific job. Special attention is given to electrolytic capacitors, regen-

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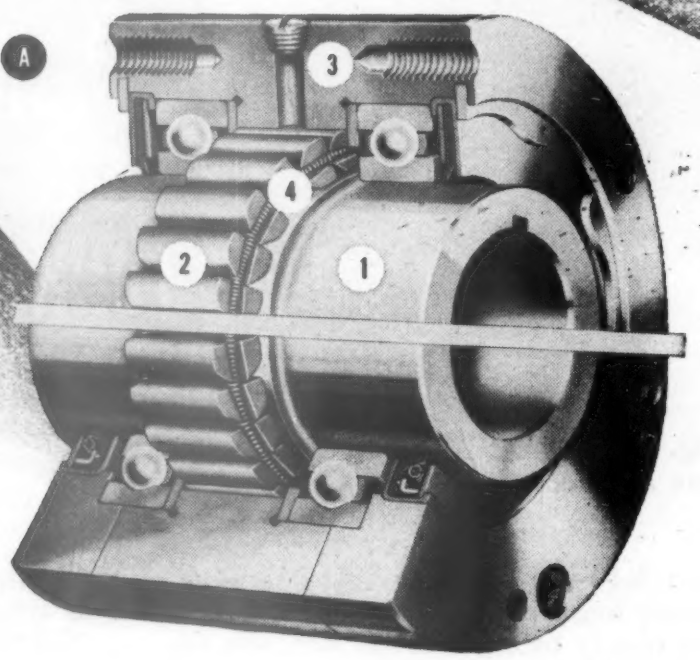
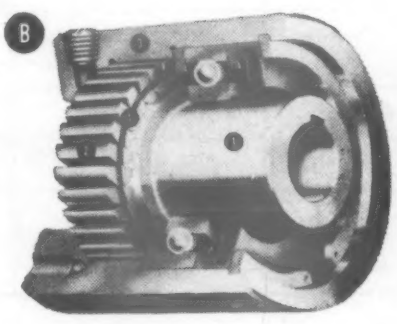
A

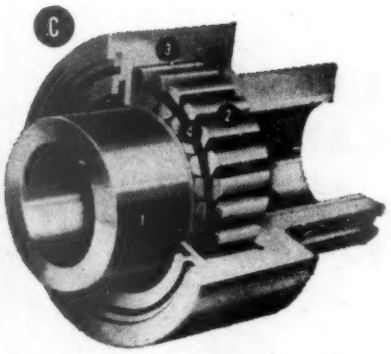


1. Inner Member 2. Sprag 3. Housing 4. Energizing Spring

B



C



1. Inner Member 2. Sprag 3. Housing 4. Energizing Spring

Roller Chain Drives

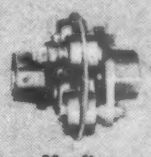

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Fig. 1571
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That h-i-s-s-s-s-s you may hear around your air lines means there's a villain loose in your plant. Costly compressed air is escaping, costing you money by the minute. But, you say . . . "it's only a pinhole, can't amount to much." Look at the chart below.

A SMALL LEAK MAY COST YOU AS MUCH AS $5.82 A MONTH

AREA OF LEAK	AIR	
Diameter Inches	Number of cubic feet per month at 75 lb. pressure	Total cost of waste per month 11c per 1000 cubic feet
1/4"	3,366,990	$ 370.37
1/8"	824,570	$ 90.70
1/16"	213,000	$ 23.43
1/32"	52,910	$ 5.82

Check your plant . . . compressed air leaks mean that good dollars are "gone with the wind." Replace leaky or defective air devices with LUNKENHEIMER Air Cocks, Valves, Nozzles. Designed for air line service, LUNKENHEIMER Air Devices seat tight and stay tight, requiring minimum maintenance for long, efficient service life. Your Lunkenheimer Distributor has a stock of these devices and fittings. *Write for Circular No. 587 and enlarged copy of air leak chart, suitable for posting.*

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WALTER J. CREAMER, B.A., E.E., Professor of Communication Engineering, Head of Department of Electrical Engineering, University of Maine. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. 344 pages. Photographs, diagrams, sketches, tables, graphs, formulas, problems, appendix, index. $4.

A text, designed to serve as a medium of transition from conventional college mathematics and physics courses to the more advanced courses in electrical engineering. Deals with d.c analysis, properties of conductors and insulators, various types of meters and measuring networks, electrochemical principles of d.c. motors and generators and elementary electronics.

BOOKLETS

LABOR-MANAGEMENT RELATIONS. Report of the Joint Committee on Labor-Management Relations, Congress of the United States. U. S. Government Printing Office, Washington, D. C. 198 pages. No charge.

FLOORING HARDWOODS. Forest Products Research Bulletin No. 21, Dept. of Scientific and Industrial Research. The Director, Forest Products Research Laboratory, Princes Risborough, Aylesbury, Bucks, England. One shilling.

ASTM STANDARDS ON PAINT, VARNISH, LACQUER, AND RELATED PRODUCTS. Specifications, Methods of Testing, Definitions of Terms. American Society for Testing Materials, 1916 Race St., Philadelphia 3. 580 pages. Photographs, diagrams, sketches, graphs, tables, formulas. $4.35.

TOWARD SECURITY AND A STEADY JOB. Standard Oil Co., Room 1626, 30 Rockefeller Plaza, New York 20. 14 pages. No charge.

CURRENT DEVELOPMENTS AND IMPROVEMENTS in the Employment of Lead-Lined Products, Chemical Apparatus, and in Lead Construction, Compared with Past Practices. Alfred P. Knapp, President, Knapp Mills, Inc., 121 Broad St., New York 4. 12 pages. Graphs. No charge.

TRENDS IN RETIREMENT PLANNING. With a Paper on Reducing Premium Costs. Insurance Series No. 73. American Management Association, 330 West 42nd St., New York 18. 32 pages. 50c.

STRENGTHENING MANAGEMENT'S CHANNELS OF COMMUNICATION. Personnel Series No. 116 American Management Association, 330 West 42nd St., New York 18. 47 pages. $1.

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Sets a new high in crane efficiency and economy.

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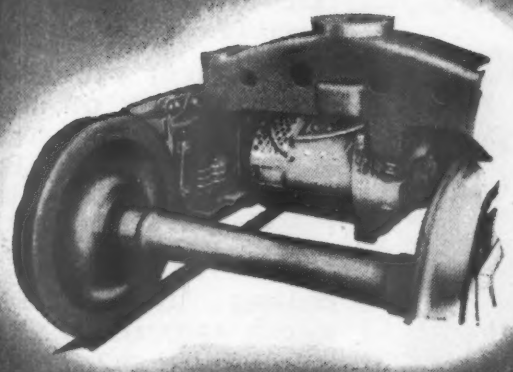
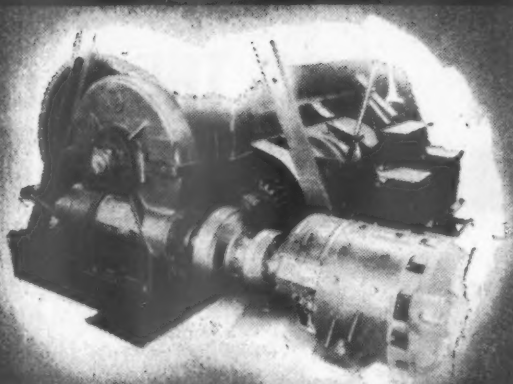
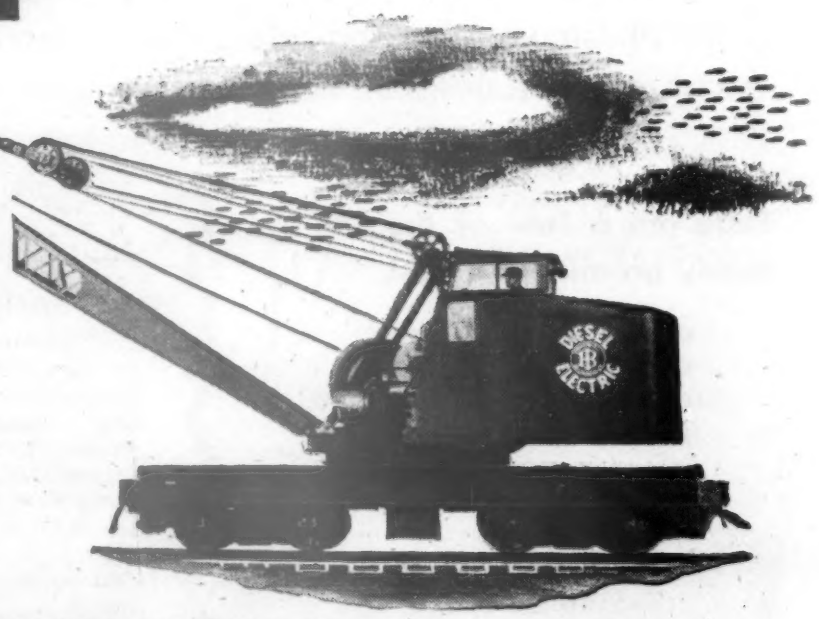


1 Travel clutches and complicated gearing have been eliminated by installing spring mounted motors inside the A.A.R. cast steel side frames to supply travel power as axles

2 Operator in Monitor-type cab has 360° visibility and an unobstructed view of hoist and boom drums for faster, safer crane operation.



3 Electric swing is available, with power supplied by separate generator which is also provided for magnet service and night lighting.



Illustrated are only a few of the features engineered into the new Brownhoist Diesel Electric Locomotive-Crane. In addition, 15 M.P.H. travel speeds, coupled with plenty of power, make it a *quick-accelerating switch engine that will keep cars rolling* in and out of your yards. Hoist drums are mounted on roller bearings, with clutch and brake bands on separate flanges. All boom cable is taken on the drum in one lap, hence no overwinding. Safe worm driven boom hoist and 14″ safety clearance between rotating superstructure and car body *means added safety for your workmen.* And, of great importance in these days of increased operating costs, you get top economy from cheap fuel. Write today for complete particulars.

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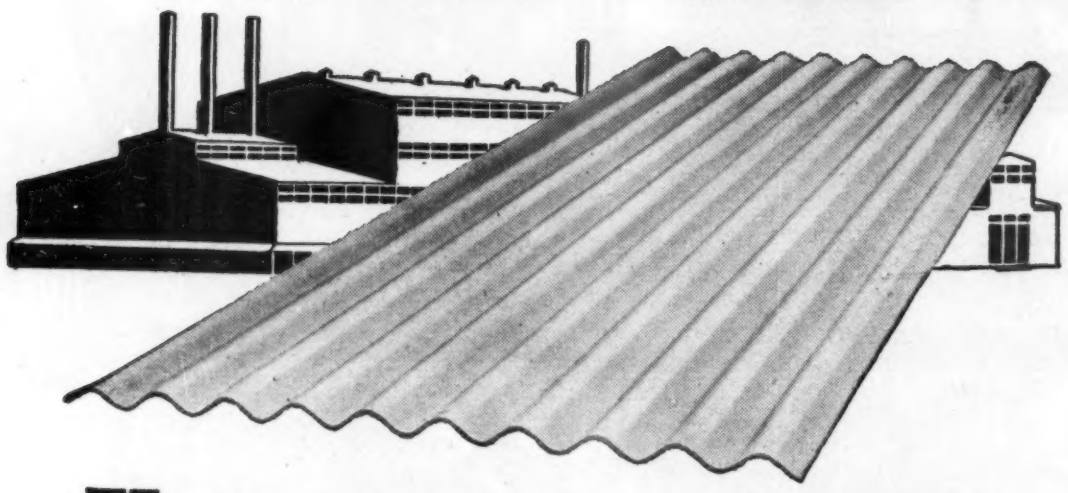

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JUNE

7-19, Summer Management Course devoted to Production Planning, Plant Layout, Motion and Time Study, Wage Incentives, and related subjects. University of Iowa, Ralph M. Barnes, Director, College of Engineering, University of Iowa, Iowa City.

14-18, Society for the Promotion of Engineering Education, Annual Convention, University of Texas, Austin. Professor Arthur B. Bronwell, Electrical Engineering Dept., Northwestern University, Evanston, Ill.

20-23, National Association of Cost Accountants, Annual Meeting, Waldorf-Astoria Hotel, New York. Arthur Gunnarson, Assistant Secretary, 385 Madison Ave., New York.

21-23, American Society of Heating and Ventilating Engineers, Semi-Annual Meeting, Hotel Mount Washington, Breton Woods, N. H. A. V. Hutchinson, Secretary, 51 Madison, New York.

21-25, American Institute of Electrical Engineers, Summer Convention, Palace of Fine Arts, Mexico City. H. H. Henline, Secretary, 29 West 39th St., New York.

21-27, American Society for Testing Materials, 51st Annual Meeting, Book Cadillac Hotel, Detroit. Robert J. Painter, Assistant Secretary, 1916 Race St., Philadelphia 3.

JULY

21-24, Silver Bay Conference on In-

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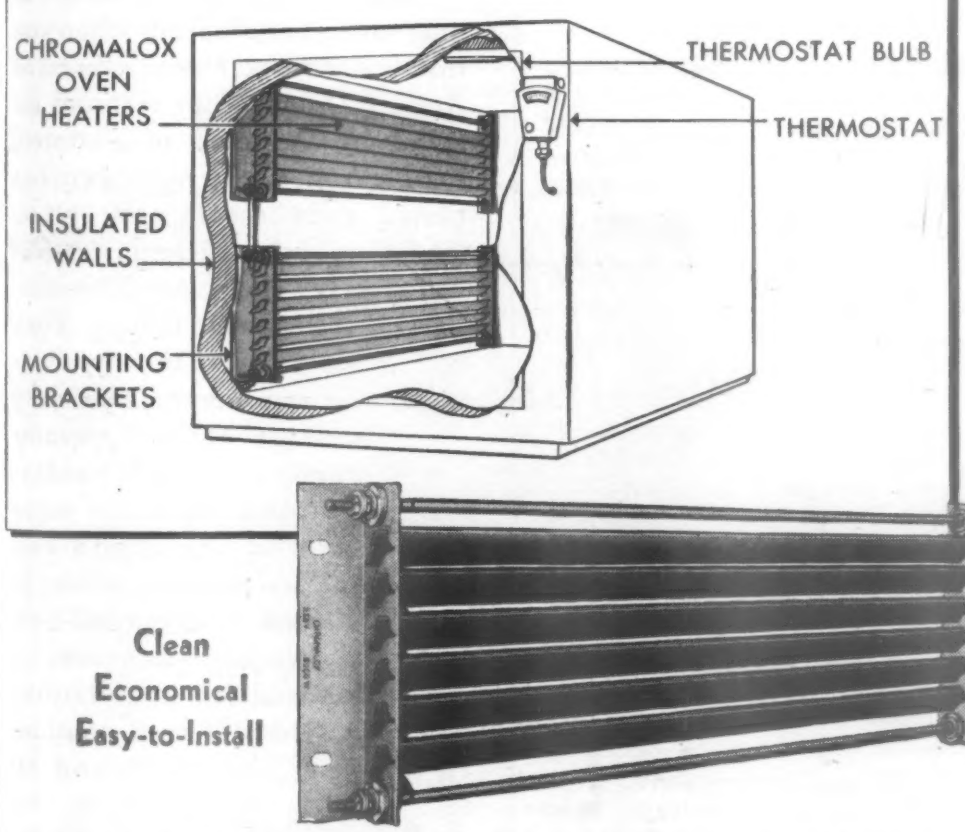

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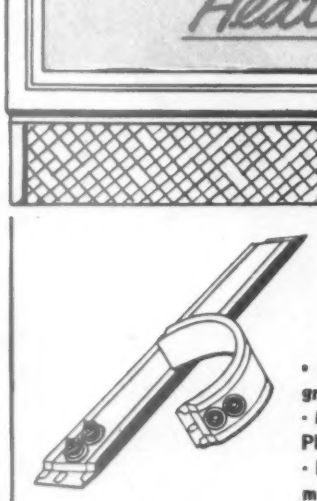

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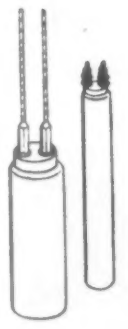

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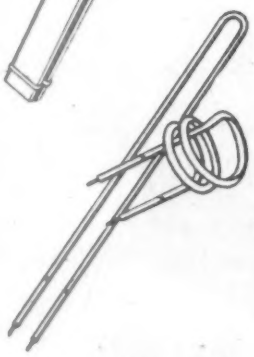

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ference. Silver Bay-on-Lake George, N. Y. W. F. Meyer, Executive Secretary, 347 Madison Ave., New York.

AUGUST

22-26, National Association of Power Engineers Inc., National Power Show and Convention, St. Paul Auditorium, St. Paul, Minn. A. F. Thompson, Director of Exhibits, 176 West Adams St., Chicago.

24-27, American Institute of Electrical Engineers, Pacific Coast General Meeting, Hotel Davenport, Spokane, Wash. H. H. Henline, Sec., 27 West 39th St., New York 18.

30-Sept. 3, American Chemical Society, National Meeting, Washington, D. C. Alden H. Emery, Executive Secretary, 1155 Sixteenth St., N. W., Washington 6, D. C.

SEPTEMBER

6-10, American Chemical Society, National Meeting, St. Louis, Mo. Alden H. Emery, Executive Secretary, 1155 Sixteenth St., N. W., Washington 6, D. C.

7-9, American Society of Mechanical Engineers, Fall Meeting, Reed College, Portland, Ore. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York 18.

8-12, The Instrument Society of America, Third Annual Conference and Exhibit, Convention Hall, Philadelphia. Richard Rimbach, Executive Secretary, 1117 Wolfendale St., Pittsburgh 12.

9-17, Course in Quality Control by Statistical Methods, Purdue University. Prof. Irving W. Burr, Department of Mathematics, Lafayette, Ind.

13-17, American Chemical Society, National Meeting, Portland, Ore. Alden H. Emery, Executive Secretary, 1155 Sixteenth St., N. W., Washington 6, D. C.

20-24, Illuminating Engineering Society, 24th Annual Meeting, Hotel Statler, Boston. G. K. Hardacre, General Secretary, 51 Madison Ave., New York.

23-27, The National Association of Foremen, 25th Annual Convention, Benjamin Franklin Hotel, Philadelphia. Clarence Akridge, Benjamin Franklin Hotel, Philadelphia.

27-Oct. 1, Society of the Plastics Industry, National Plastics Exposition, Grand Central Palace, New York. Ronald Kinnear, Committee Chairman, 295 Madison Ave., New York.

28-Oct. 1, Association of Iron & Steel Engineers, Annual Convention and Exposition, Cleveland Public Auditorium. T. J. Ess, Managing Director, Empire Bldg., Pittsburgh.

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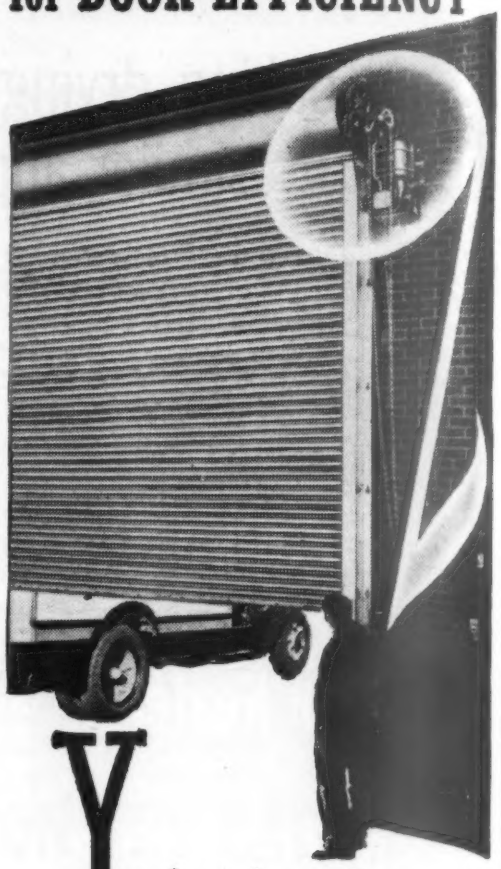

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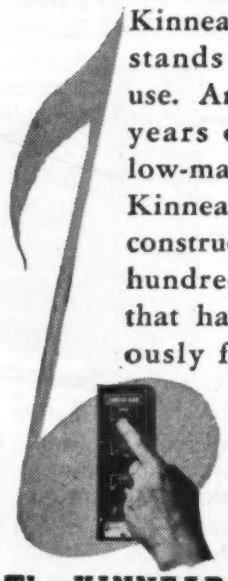

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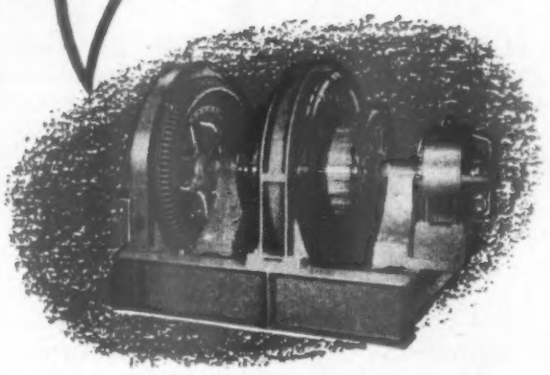

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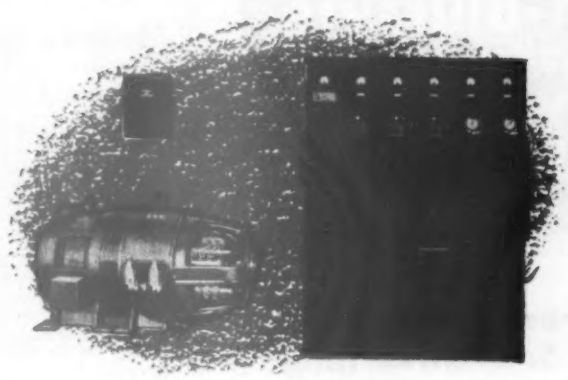

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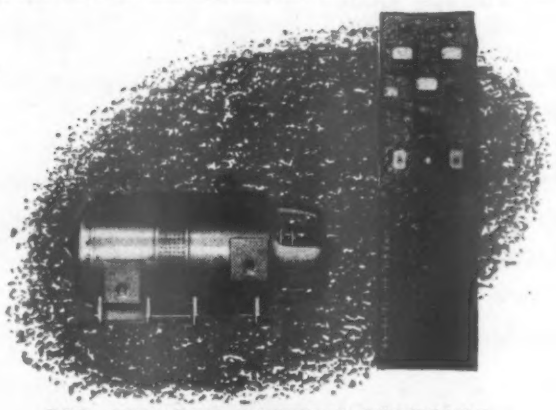

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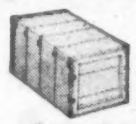

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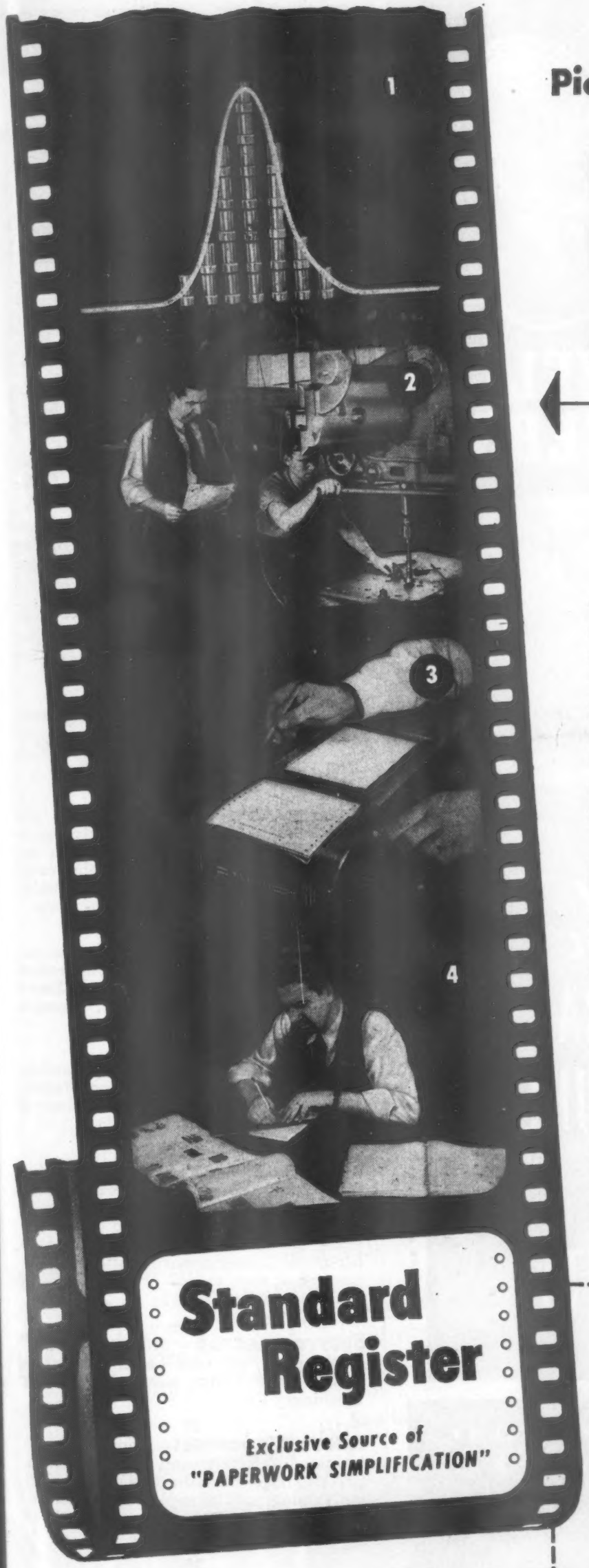

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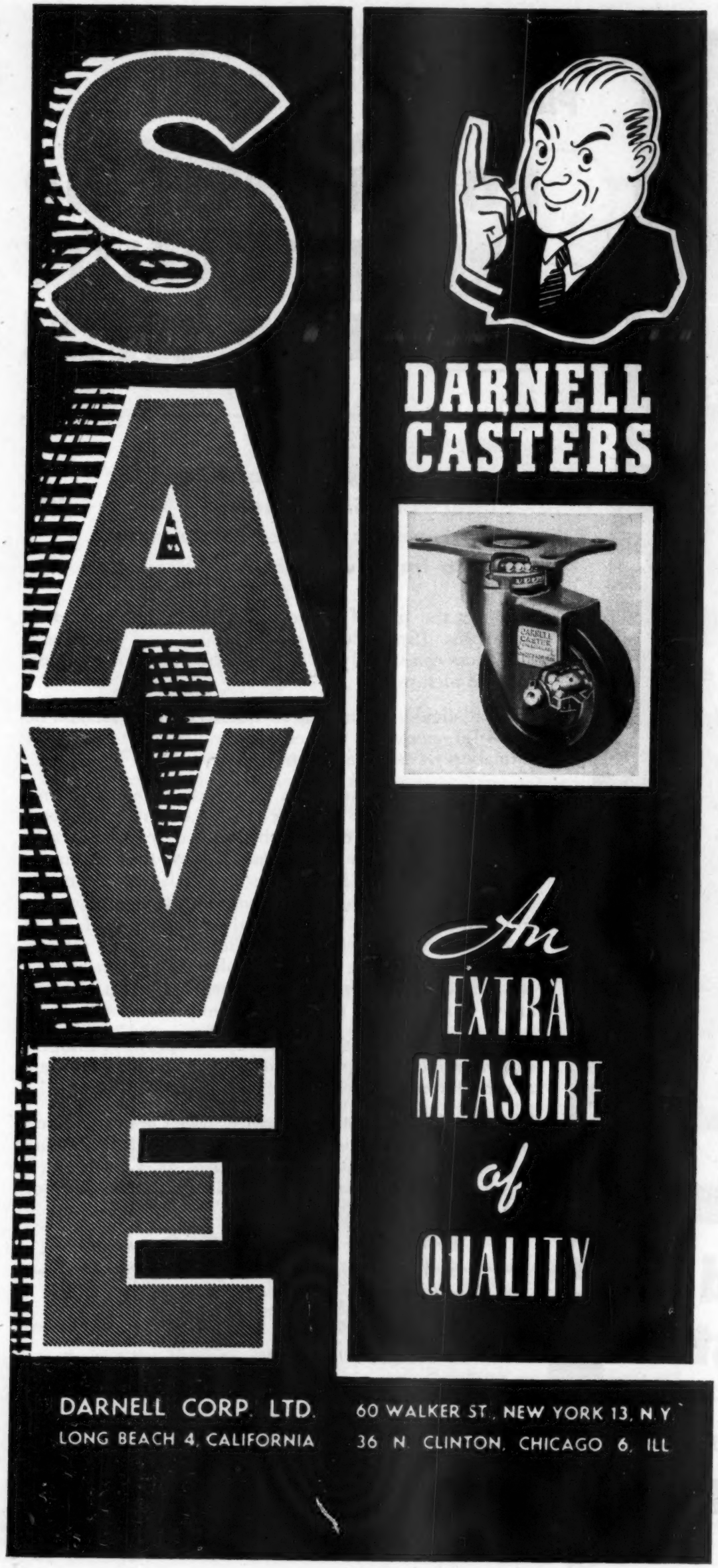
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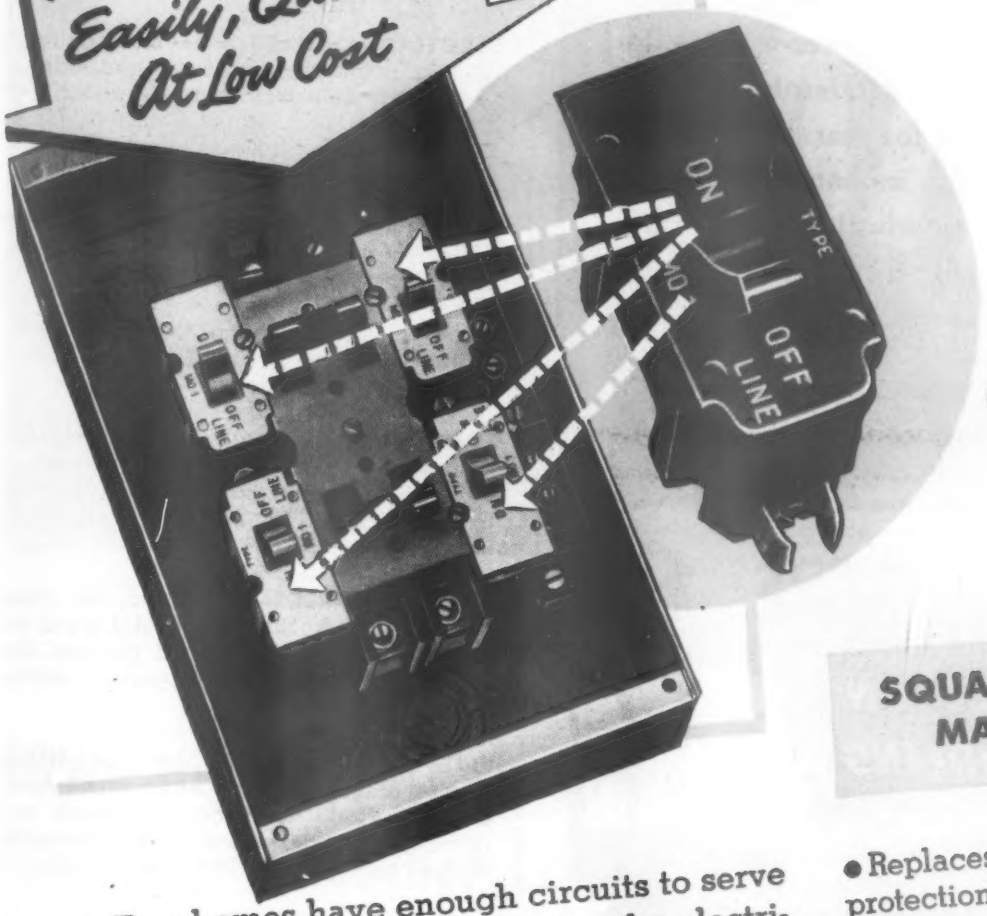

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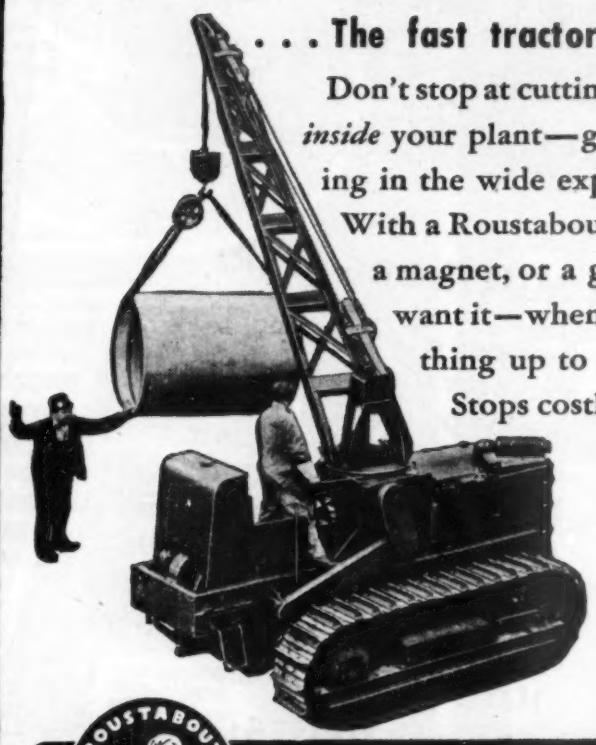

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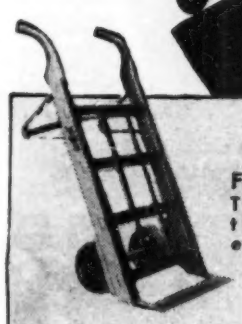

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Fig. 1136 One of many sizes and styles of bar handle platform trucks

Fig. 419-421 Jack and Live Skid

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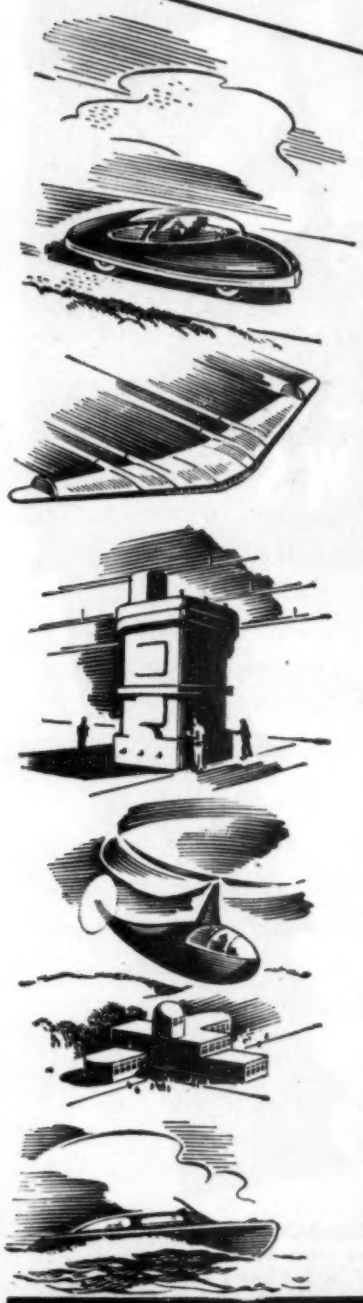

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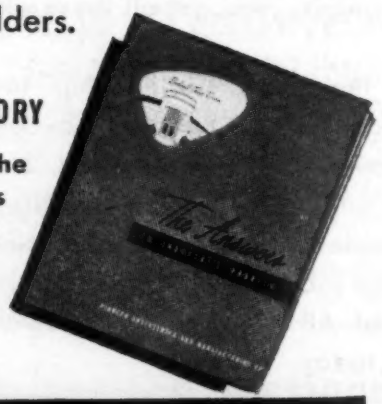

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FLUORESCENT FIXTURES—**53(a)** Inspection fixtures, 1-, 2-, and 3-lamp units, and accessories. Bulletin 30-D. **53(b)** Twin 40-watt white-enamel reflector lamp type, No. 240T. Bulletin 30-E. **53(c)** Numerical index 60-A-3. Lists all available items, catalog numbers, prices. Day-Brite Lighting, Inc.

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SOLVENT ADDITIVE—for use in cleaning metal. "Actusol and Solvent Information," 10-page booklet. Flash points, boiling ranges, chemical constitution, toxicity, trade names. Instructions on selection of correct solvent for specific jobs. The DuBois Co.

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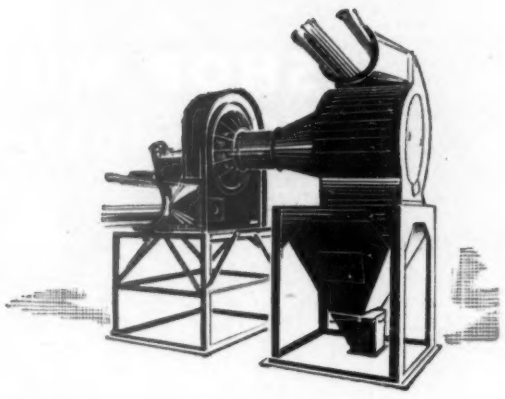
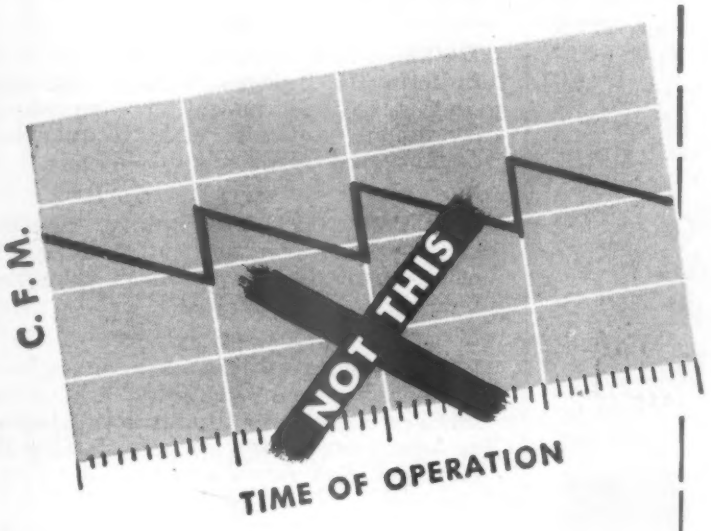
SOUND EQUIPMENT—Amplifiers, speakers, microphones, complete systems, accesories; illustrations, specifications, prices. Catalog 48, 24 pages. Mark Simpson Mfg. Co., Inc.

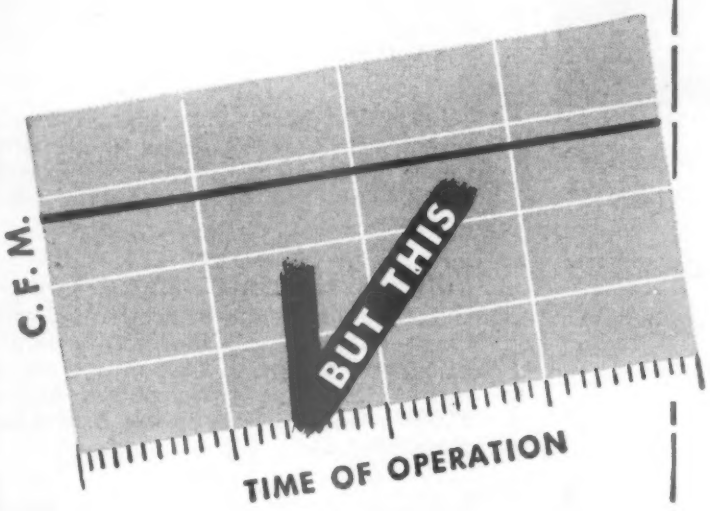
93

SPEED REDUCERS—motorless worm gear,

Continuous dust control demands constant air volume







Roto-Clone's uniform air delivery assures constant effective control at dust source

THE two charts at left tell an important story. The one above shows how rapidly air volume declines as ordinary type collectors become clogged with dust. Result—constantly varying exhaust volume with parallel variations in effectiveness of control at point of dust generation.

Now examine the chart below. This is a Roto-Clone* at work. Constant air volume is exhausted hour after hour, day in and day out. Continuous high efficiency dust collection is assured without a minute's time out for unit maintenance.

The Roto-Clone method of dust control applies centrifugal and dynamic forces in combination to remove the dust particles from the air stream. There are no collecting elements to clog or clean. Dust is discharged automatically for easy removal without interference to operation.

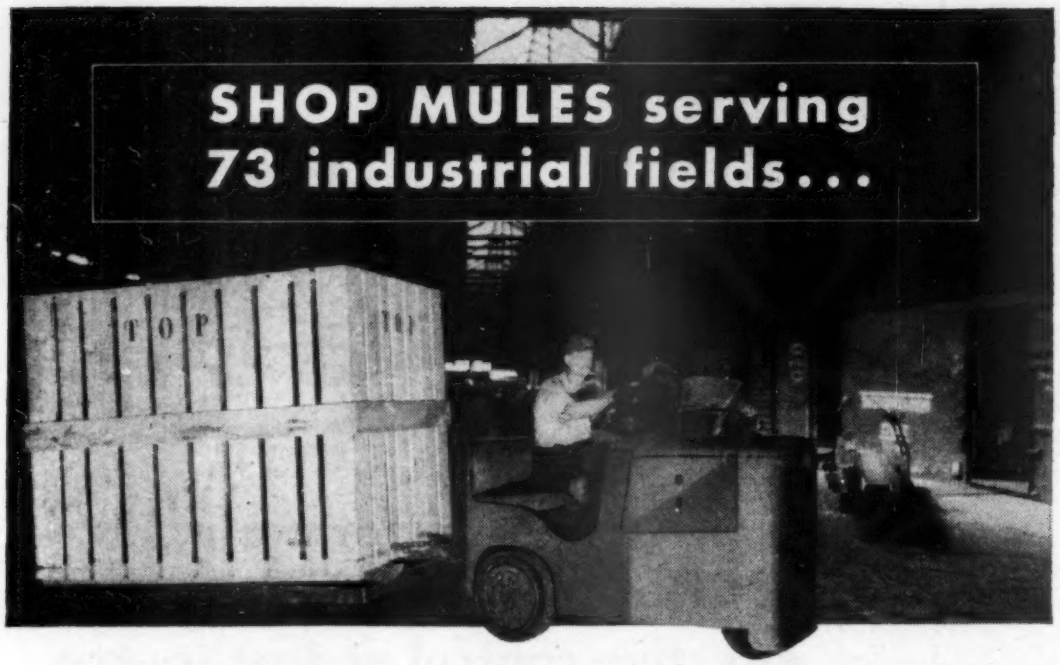
If you want to put dust control on a continuous high efficiency basis, you will want to put Roto-Clone with its small space requirements on the job. There's a type and size for every service. For complete information, contact your local AAF representative or write direct for copy of Bulletin No. 270-A.

**Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precicipitator types.*

AMERICAN AIR FILTER CO., INC.
361 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT



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